

STORAGE

REPORT OF OBSERVATIONS
OF ^{Biological}
^{& Medical}
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INJURIOUS INSECTS

AND
COMMON CROP PESTS

DURING THE YEAR 1883,

WITH METHODS OF
PREVENTION AND REMEDY.

BY

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ECONOMIC ENTOMOLOGY AT THE ROYAL AGRICULTURAL COLLEGE, CIRENCESTER;
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P R E F A C E.

IN offering my Seventh Yearly Report to the contributors who have favoured me with notes of observation, I once again beg them to accept my sincere thanks for their very serviceable information.

Further, I should be doing wrong in not acknowledging the great obligations I am under both to the agricultural and general press not only in encouragement of my endeavours, but also in drawing attention to the great importance of the subject of *practicable* agricultural measures being often available at a paying rate to save the field crops from attack, or carry them through it. I also gratefully acknowledge the kind assistance I have received from Professor J. O. Westwood, Life President of the Entomological Society, Mr. R. H. Meade, and Mr. G. B. Buckton in naming specimens I was unacquainted with. To all I tender my hearty thanks, and earnestly request their continued kind assistance.

The most severe attacks of the past season of 1883 have (chiefly) been those of Fly-maggots and grubs of various sorts. Daddy Longlegs grubs were a general trouble ; so were Cabbage and Turnip-root maggots ; and likewise the maggots of the Celery and Parsnip Leaf-miner ; and in some places those of the Mangold Leaf-miner. More information is much needed as to the means of prevention and remedy of these four kinds of attacks, and also as to the reasons of the prevalence of the last two.

Mangold-leaf maggots have hitherto been supposed, in this country, to belong to only one kind of Fly, but there appears now reason to think that other kinds may be present, and therefore specimens of Mangold-leaf maggots would be very acceptable in the coming season, as points in the habits of the Flies they

turn to may thus be made out, which may help us to check attack.

The observations on Hop Aphis are still quite imperfect. These are given as an Appendix, as it was desirable to distribute them amongst observers before the date of issuing this Report; and since then I have received information (from previous observations given by two careful observers) respectively of the Fly having been seen on young Hop just coming out of the ground, and of the nits being found at the lowest part of the stem and gradually spreading upwards. I have reason to believe these observations perfectly correct and very important. Further information would be particularly acceptable regarding Hop Aphis.

Reports have been sent in regarding several kinds of attacks to fruit crops, which are important in orchard-farming, many of which, it will be observed, may be prevented or forestalled by any measures (such as having sheep present in orchards, or skimming the surface-soil in gardens) which will get rid at once of the fallen infested fruit, or the infested surface-soil, before the grubs go through their changes.

One great point of the observations of the past year is the notice taken of the presence of grubs and maggots of various kinds that infest the roots of our farm crops being also found in dung, farm manure, and compost heaps, and thus carted on to the fields.

This is one of the broad subjects, like amount of bird-presence, which bears on all agricultural practice, and which we need to know more about. It is not a question of withholding farm manure, but of *not permitting neglected or weed-grown heaps* to become head-quarters of Daddy Longlegs grubs, &c. Likewise, as there are many kinds of maggots whose whole history is not known, which are found in dung and compost heaps,—and also we find crops “going off,” as it is termed, from attacks of maggots of which little has been recorded save that they have been found in *rotting material*,—it would be very desirable to have specimens and notes of these maggots whereby to make out their whole history.

This subject has been brought forward in clearer and better form than I can place it in the circular issued by the Royal Agricultural Society requesting observations, of which the main points desired are there fully given, with pages for entries. I

shall have pleasure in forwarding copies of this circular to all applicants, and shall be greatly obliged for observations and specimens of maggots from the localities there specified.

The subject of attention to insect-ravage has spread widely and serviceably during the last year both at home and in the Colonies; at Port Elizabeth in Cape Colony, in Australia, and also in the sugar-cane plantations of the West Indies and the coffee plantations of Ceylon, the agriculturists or the planters are learning the use of attacking the attacker themselves on the basis of *their own knowledge* from observation of *its habits*, instead of wasting time on specific descriptions *only* leading to its name, and the benefit is appreciable now, and we may hope it will be great.

In our own country such an important example as to possibility of teaching all that is needed on this subject for common farm use has been given by the plan carried out at the Aldersey Grammar School, Bunbury, Cheshire, that, as enquiry is often sent me as to method of conveying instruction,—and I am sure such instruction may well be classed amongst “means of prevention and remedy,”—I, with permission, append the description of the plan followed in a note.

The illustrations in the present Report are chiefly from electros of the blocks by John Curtis in his ‘Farm Insects,’ the use of which I am permitted by Messrs. Blackie, of Glasgow, and acknowledge with thanks for their constant and courteous assistance. I also express my acknowledgments for the use of some figures by Prof. J. O. Westwood and John Curtis, which are allowed by the proprietors of the ‘Gardeners’ Chronicle,’ and likewise for some from Newman’s ‘British Moths,’ permitted by Mr. Allen.

I again, with hearty thanks to all those who kindly favour me with information for publication, earnestly request their co-operation in the coming season.

ELEANOR A. ORMEROD.

DUNSTER LODGE, NEAR ISLEWORTH,
March, 1884.

NOTE.—The subject of how to set on foot instruction in country schools relatively to prevention of insect injury to farm crops, of a sound *plain* kind such as should be practically and truly serviceable for field use has so often been brought before me that I give here, with permission, the following information of the manner in which this has in the last three years been begun, and is being serviceably carried on, at the Aldersey Grammar School at Bunbury, near Tarporley, in Cheshire.

This old-established school is under the government of the Worshipful Company of Haberdashers of London, and, at the suggestion of J. Curtis, Esq., a member of the court, as to the importance of the boys of this agricultural district receiving instruction as to the means of preservation of the crops from insect-ravage, a pecuniary grant was liberally given by the Company for necessary working materials, and, with the addition of a very few books on the subject, plain and sound, but of small cost, of the six Diagrams of Crop Insects of the Royal Agricultural Society (procurable at 5s. to 8s., paper or cloth), and a few other large coloured drawings, and also the gift of a microscope by W. H. Baigent, Esq., one of the past Masters of the Company, all that was needed for a start was collected.

Under the efficient direction of the Head Master, Mr. W. Bailey, the boys received a course of lessons on insect-life, illustrated by *living specimens* and diagrams, the instruction given being thus made perfectly intelligible, and further carried out by the scholars themselves collecting and bringing specimens, and, where necessary, given the use of the cheap and simple apparatus known as a breeding-cage, in which they could watch the changes from the maggot and larval state to the pupa. The pupils thus shortly became well acquainted with the common crop-pests, such as Click Beetles and Wireworms, Turnip Fly, Leather Jackets or Daddy Longlegs, Cabbage and Turnip-root grubs, &c. In fact, *the great step* was made; by the simple but sound method of teaching pursued the boys had learnt to know *the crop-pests* by sight, without doubt or mental worry, just as they knew *the crops* that the insects infest.

Having thus gained a knowledge (by their own observation, under Mr. Bailey's guidance) of the appearance and habits of the crop-pests, the next step was to learn to know how to turn the knowledge to practical service. This movement met the full approval of the neighbouring farmers, and on the appearance of attacks methods which have been advised in these Yearly Reports on the authority of many of our agriculturists were tried,—as, for instance, for Daddy Longlegs grubs, &c.,—and much good was done.

The school, being situated in the middle of a large and purely agricultural district, in a few years the majority of the scholars will be either the farmers or the farm-labourers in the parish, and (instead of being, as in many cases, utterly in the dark as to what is injuring the crop) they will come prepared, not *merely* with names, but with *a knowledge which is a part of themselves*, enabling them to tell what is going on by the state of the injured crop, and also aware not only of the means of prevention or of lessening the effect of ravage, but of the *reasons* for the various methods of treatment.

The success has been so satisfactory that I take leave to draw attention to it here, as meeting a great want, and showing how by practical plain instruction (and without taking the place of necessary school studies), and without an instructor added for this special branch, and with the full approbation of the governors of the school and of the neighbouring farmers, and likewise with the approval of the examiners of the school and the agricultural visitors, the plan has been brought to work.

I do not give details here, but, having had the pleasure of in some slight degree co-operating from the first with the Head Master and the members of the Company in their useful work, I should feel great satisfaction in giving any information as to the books used, or other details, to any who may apply to me.—ED.

NOTES OF OBSERVATIONS
OF
INJURIOUS INSECTS
AND
COMMON CROP PESTS
DURING 1883.

APPLE.

Apple Sawfly. *Tenthredo testudinea*, Steph.; *Hoplocampa testudinea*, Cameron.

THE attack of Apple Sawfly caterpillars has not often been recorded, but is sometimes the cause of much mischief in the first stage of the crop, by means of the caterpillars feeding inside the young forming Apples.

On June 25th I found many small Apples, under trees from which they had fallen, in my garden near Isleworth. Some of the Apples were about an inch long, many were smaller. Most of the larger ones had a blackish mark on them on one side, or near the stem, and, on opening them, the inside was found to have been eaten away, so as to form a hollowed-out chamber from the mark or hole in the side to the centre and some way past it. This was filled with decayed matter formed of the gnawed pulp of the young Apple, and in this decayed matter there was in many cases one Sawfly caterpillar.

These were of various sizes (the largest about half an inch long), whitish, with a pinkish streak along the centre of the back. The largest specimen did not show the streak, very possibly from coloured matter in the food-canal having been discharged. The caterpillars are distinguished from Moth and Beetle grubs by having *six pairs of sucker feet beneath the body*, besides the pair at the end of the tail, and the three pairs of regular claw feet.

The caterpillars, on being disturbed, gave out a strong smell, something like that of the common plant-bugs (or bed-bugs), or that of the Goat Moth caterpillar. Some of the injured Apples had been already deserted by the caterpillar, which goes down into the ground for its change.

The method of attack is stated to be for the Sawflies to fly in May to the Apple blossom, and lay their eggs on the embryo fruit. Within this forming fruit the caterpillar feeds, until it falls, towards June or July, within the injured fruit, and then, creeping from it, goes down into the ground, where it forms a cocoon, in which it remains inactive until the following year.

(From my own observations I incline to think that the caterpillars also sometimes leave an infested fruit and make entrance into another from the outside, as, amongst the collection of Apples I made, I found one of the caterpillars with only about a quarter of its length sticking out of an otherwise uninjured Apple, into which it was then burrowing.)

The caterpillar turns to the pupa, and thence to the Sawfly in the cocoon below ground, and in the attack noted by Professor Westwood,* as observed by him in his garden at Hammersmith, he mentions that in the middle of May he found the Sawflies, which had come out from the cocoons, hovering about the blossoms of the Apple trees which had been infested the previous year, and distinctly saw one of the female Sawflies laying her eggs within the blossom.

The Sawfly is very like the Turnip Sawfly (figured under that head) both in size and shape, perhaps rather smaller, and may be generally described as reddish or pale orange coloured, and black, or largely mottled with black, above. The caterpillar differs from that of the Turnip Sawfly in having one pair less of sucker-feet, and is, as above mentioned, whitish, with an ochre-coloured head.

The attack was very destructive to Apples in my own garden, and on enquiry I was informed that much harm was being done just in the same way in the neighbourhood of Isleworth.

When the small Apples are found to be falling, which is often the first information of attack, of course nothing can be done to save the killed fruit, but a repetition of the attack next year may be in great degree prevented by having all the fallen Apples picked up as soon as possible, say twice a day. The caterpillar often remains some little time in the fallen fruit, and, if all the Apples are gathered up *and destroyed*, a great many caterpillars will thus be got rid of.

Where the soil under the attacked trees is not disturbed by cropping during summer, coming injury may be much lessened by skimming off the surface-soil in autumn or winter, and destroying this with the

* *Gardeners' Chronicle*, 1847, pp. 851, 852.

caterpillars or chrysalids in their cocoons, which are lying in it,—the same treatment, in fact, which answers well in getting rid of Gooseberry Sawfly caterpillar. Also it has been found that the Sawflies may be serviceably lessened in number when they are attacking the Apple blossom by shaking them down from the branches on a cloudy day, or when they are torpid from bad weather, and destroying them by sweeping them off cloths laid on the ground beforehand, or in whatever way may be most convenient.

Small Ermine Apple Moth. *Yponomeuta padella*, Stephens ;
? var. *Malivorella*, Sta. Cat.



YPONOMEUTA PADELLA.

Small Ermine Apple Moth ; caterpillars, nat. size and magnified, and cocoons in web.

The Small Ermine Apple Moth (the *Yponomeuta padella* of many authors) does great harm to Apple trees and Hawthorns.

This Moth lays her eggs in patches on the small twigs, covering them over with a kind of gum, and under this patch the little caterpillars, which hatch about October, live until next spring, when they come out and are stated to burrow *into* the young leaves and feed within for a while. When strong enough they come out, which accounts for the surprisingly sudden appearance of attack. They then feed on the leaves and spin webs, reducing the attacked hedge (or tree) to the dirty ragged appearance too well known, and in the webs the caterpillars shelter in companies, and also, when full-fed, the caterpillars draw near together in their common web, and each spins for itself a cocoon, in which it turns to a chrysalis, from which the Moth comes out about June. These are of the shape figured above, but very variable in the depth of the tint of grey of the black-spotted upper wings. The kind figured above by Professor Westwood has the upper wings white, and is named *Malivorella*, from especially infesting Apple ; but the habits of these two species (or varieties of *padella*) are so much alike, the same means of prevention are serviceable for both

these common attacks. Therefore, as the Apple is the most important, I have made the following short note of an attack on Hawthorn a reason for drawing attention to it:—

On June 29th Mr. A. Caldwell, Harrow Road, forwarded me specimens of webbed-up leaves and caterpillars, with the information that “the caterpillars have so completely devoured the leaves from one of our thorn hedges that we are afraid the attack will kill it altogether.

“We have cut all the growth the hedge has made this year to get rid of the pest; also to induce the hedge to break afresh.

“Part of the leafage which has not been completely devoured hangs all withered up, presenting a most unsightly appearance. I may mention that the hedge is within eleven feet of the edge of the Grand Junction Canal.”

The numerous specimens forwarded developed into a large supply of the *Yponomeuta padella*, the Small Ermine Moth.

Where attack is on trees mischief may be stopped by snipping off the web-nests when the caterpillars are in them, and destroying them. Of course care must be taken to cut the nests *when* the caterpillars are within, and also it is desirable to hold a pail or something below in which the caterpillars which try to get away may be caught in any mixture thought serviceable. When the caterpillars have spun in the nest, then cutting the web off with the cocoons within will get rid of much future attack.

On hedges it is difficult to get rid of them, but, as the caterpillars let themselves down by threads on alarm, probably they may be got rid of by thorough drenchings applied by a garden engine (as with Hop Aphis) of soft-soap and tobacco, very dilute, or paraffin, and the caterpillars which fall being destroyed by trampling (which boys would manage in many cases) or by throwing gas-lime, quick-lime, or anything that would kill them.

Winter Moth. *Cheimatobia brumata*, Steph.

The caterpillars of the Winter Moths (see figure), and several other nearly-allied kinds, cause much mischief yearly to leafage (and especially to the leafage of Apple and other fruit trees) which might be much lessened by observing that, as figured opposite, the female is only possessed of *abortive* wings; consequently, if any measures are taken to keep the females from walking by means of their long spider-like legs up the trees to lay their eggs, the trees can be preserved from their attack.

The following communication from Mr. J. G. Strachan, of Farm Hill Park, Stroud, bears on this point. On the 22nd of October he wrote me:—

“We have had a plague of looper grubs on the outside fruit trees here, for the last two or three years, which destroys all the blossom and leaves also on the trees, and, although we have tried every remedy abroad, we have failed to cure it.”

The further description of the grub being a pale green looper caterpillar about half an inch long when full grown, fairly suited the Winter Moth caterpillar, and, after advising smearing a band round



CHEIMATOBIA BRUMATA.

Winter Moth. Male, winged ; female, with abortive wings.

the base of the trees with any sticky material which might stop the females in their upward passage, I received the following note from Mr. Charman, gardener at Farm Hill Park :—

“Nov. 10th. I have used Davidson’s composition, and find it sticks fast everything that touches it, and I find a quantity of wingless female moths stuck to the base of the trees.”

On Dec. 11th he further mentioned :—“I have caught upwards of 500 of the female moths, and they are still going up the trees, but I could not say that they were travelling up *every* evening. The method I adopt for catching them is as follows :—I paint the stem with the composition for about a foot, sometimes two feet if the tree is a standard. I then go round in the morning, or whenever I have the opportunity, which is sometimes not for two or three days, and with an old knife and tin lid to put them in, take off all the moths I can find attached to the composition and burn them.

“I found thirty yesterday stuck to one Apple tree, and I should think that each female would produce at least a hundred eggs, and some a great many more. I counted three hundred from one large Moth.”

In this case the attack, judging from the specimens forwarded appeared to be that of *Hybernia Prosapiaria* (Westwood), a kind of Winter Moth a little larger than what is known as the “Common Winter Moth,” figured above ; but the treatment for all is the same.

In either case the female Moth *walks* up the stems of the trees she is about to lay eggs on in the late autumn or during winter (whence the name), and the simple process mentioned above is a most effectual preventive of attack.

If left alone this attack is as destructive to fruit trees as any that we have, and the following notes give some idea of the mischief it causes, and the need of a working remedy:—

Mr. J. W. Ellis, writing from Water Meetings, mentions:—"I enclose specimens of caterpillars that do much damage in this part of Lancashire. They damage the Apple, Cherry, Black Currant, and Gooseberry. We cannot trace them any nearer their commencement than to the young leaves when they unfold, and they are prevented from opening by a web. The caterpillar eats holes in the leaf and then leaves it, and begins to eat at the fruit, making one hole in a berry, and will then select another. The fruit so bitten invariably falls to the ground.

"We sometimes have half our crops spoiled by this insect. We cannot find out how it comes, nor into what state it goes. We have tried to destroy it by white hellebore and by lime-wash, but neither seemed to affect it. The caterpillars disappear about midsummer (June 20th to 30th)."

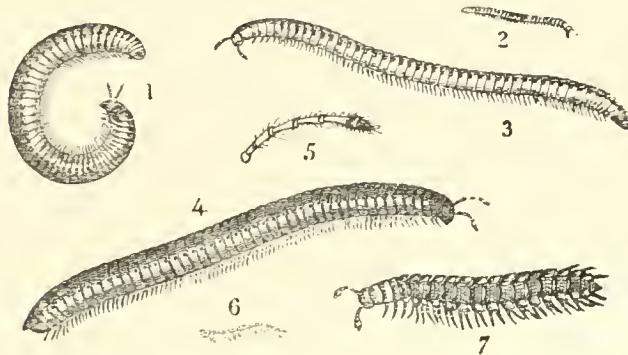
Dr. T. A. Chapman, Hereford, mentions:—"This spring the *Cheimatobia* has, within my range of observation, actually stripped trees of their leaves, and in one case half an orchard."

When once the green "looper" caterpillars of the Winter Moth have established themselves on a tree little can be done to check their ravage, excepting what can be managed by smart shaking of the boughs, so as to make the caterpillars let themselves down by threads, and then getting rid of them by trampling on such as fall and sweeping away all that may be dangling in the air beneath the branches with a pole, or any other convenient implement.

The caterpillars of the above-mentioned Winter Moths turn to chrysalids during summer, either in or on the surface of the ground beneath the branches of the trees they have been stripping of their leafage; and clearing away the surface-soil and destroying it with the contained chrysalids, or slightly sprinkling fresh gas-lime on the ground so as to give the caterpillars a poisonous reception below when they are falling after they have come to full growth, would do good.

But in any case a sticky band, which isolates the tree from attack, is a cheap and sound treatment.

BEANS.

False Wireworms; Julius Worms. *Julidæ*.

JULIDÆ.

1, *Julus Londinensis*; 2, 3, *J. guttatus*; 4, *J. terrestris*; 5. horn; 6, 7, *Polydesmus complanatus*; all magnified; and 2 and 6, nat. size.*

The Snake Millepedes or Julius Worms, sometimes known as "False Wireworms," are not true insects, inasmuch as they never have wings throughout their lives. They remain very much like what they were when first hatched, excepting that with successive moults there is an increase in the number of their feet, from the three pairs they start with, up to a large amount.

The injury they cause is, however, so very like that of grubs, maggots, and wireworms, that they often pass as insects or insect allies; and the amount of harm they do makes it desirable to draw attention to them.

During the last season much harm has been reported as caused in various localities by various kinds of these Julius Worms or Millepedes.

One of the first observations I was favoured with about these pests was from Mr. W. Glenny, Barking, on the 17th of May, who mentioned that early-sown Scarlet Runners, or French Beans, in cool chilly weather, spear very slowly, and, if the land is cold and clung, they

* *Julus guttatus*, Fab., *J. pulchellus*, Leach, the "Beautiful" Snake Millepede, may be known by its ochreous colour, with a row of crimson spots along each side, excepting near the head and tail. After death this kind turns to a reddish purple tint.

The females of the *Julus* worms or Snake Millepedes are stated to lay their eggs in the ground from about the end of December until the following May, and young *Julidæ* live two years before they are perfect. They are to be found under clods of earth and rubbish, such as bricks, stones, and pieces of wood, as well as under bark, or in moss, or, in some cases, amongst dead leaves, and they are said to propagate most in undisturbed ground. All measures that would remove or break up such shelters or breeding ground would therefore be useful.

are exceedingly liable to foes before they show themselves above the surface. A sample of these enemies is forwarded. [These proved to be specimens of the Flattened Snake Millepede, *Polydesmus complanatus*, figured above at 6 and 7, nat. size and magnified, ED.] They are not Wireworm, but work in the same way when the seed is germinating, and in the cleft between the two lobes of the Bean you will find them active. The plant, if not killed, comes up blind, and a gappy crop succeeds.

“The field where these were taken from is a marshy soil, and might have been grass some years ago : here one finds such creatures in great abundance.”

[On the 20th of May more Beans and their pest were sent, some of which I found to be the Earth Julius Worm or Snake Millepede, *Julus terrestris* figured above at 4, magnified, ED.]

On the 24th of September Mr. Glenny further mentioned :—“The Snake Millepedes did their work undisturbed, and a thin crop of Scarlet Runners was the result. It would have been impossible to stop them after writing to you, as the mischief was already accomplished.”

Mr. Glenny suggests that it might be of service to mix carbolic acid (sufficiently diluted) with the seed before sowing, in the same way as Wheat is now dressed to keep away small birds. This would make the Bean unpalatable and less attractive to underground foes ; and further, relatively to the suggestions I had offered, formed from study of the habits of the pest, it is observed :—“Your suggestions to move the ground frequently before planting, to eradicate all rubbish and garbage, to sow *not too early*, are what I can endorse entirely. By planting before the usual time the seed is longer in germinating on account of the lowness of the temperature ; thus more time is allotted to the insects to destroy or feed upon the grain.”

Mr. R. Cooke notes that at the Croft, Detling, near Maidstone, the Broad Beans, and to a less degree Scarlet Runners, were very much thinned between sowing and germination. They proved, when examined, to be full of centipedes, as many as sixteen in one Bean.

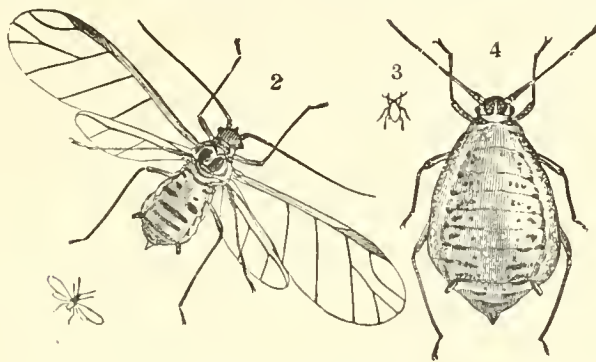
The question is asked, “Did the Beans die first, and the centipedes only eat the rotten seed, or did the centipede kill the Bean by eating it when still good ?” I think the latter, as some Beans germinated and came through the ground with almost white seed-leaves.

Mr. J. Addison, writing from Mapledurwell, Basingstoke, mentions, with regard to measures of prevention :—“I forget if I told you that last season my mangels were much injured by the False Wireworm. I got rid of many of them by placing cotton cake just under the soil, and I found also (when too late) that salt easily killed the millepedes.

I also received specimens of the Spotted Snake Millepede from near Bradford as a pest very destructive to vegetation. In this case specimens of the present and last season were sent.

CABBAGE.

Cabbage Aphis. *Aphis Brassicae*, Linn.



APHIS BRASSICÆ.

1, 2, male ; 3, 4, female ; nat. size and magnified.

After mentioning various bad crop attacks from insects or insect allies which have occurred this season near Barking, Mr. W. W. Glenney further notes :—" But the greatest loss has been from White Lice. They have descended in myriads upon Turnips, Savoys, and Cabbages. Some crops of the former have been annihilated, more particularly the autumn-sown pieces. No description of the Cabbage tribe has escaped. The produce now reaching the metropolitan markets from our district is damaged and reduced in value by these disgusting pests on the exterior covering.

" The leaves of the plant curl over the intruders in such a way that wind and rain hardly interfere with their devastating progress, and when the heart of the young and tender esculent is reached its doom is fixed, and the crop is settled."

The Cabbage Aphides probably take the name of " White Lice " from the light colour of the young when first produced, and, like Hop Aphis, how to get rid of them on a large scale of cultivation needs yet to be made out.

Something may be done in garden growing by cutting off the leaves which are infested as soon as ever patches of Lice are seen beneath them. The attack would then be prevented from spreading ; and likewise, in garden cultivation, a good drenching of soft-soap with

a little tobacco into the hearts of the plants, where it would lodge and stifle the Lice, would be sure to do good.

Waterings with some plant stimulant, such as nitrate of soda, would also do good in keeping up a strong healthy growth.

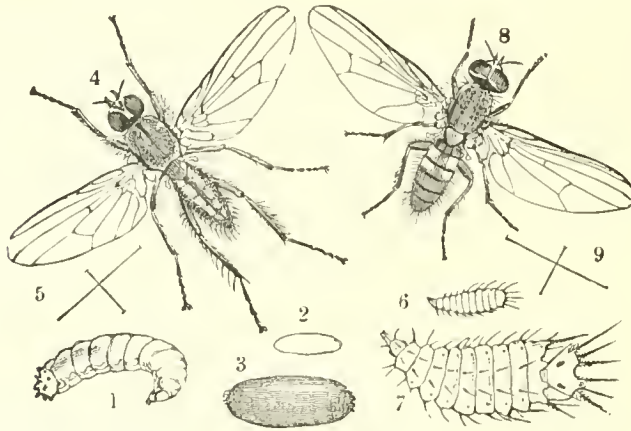
This *Aphis* frequents Charlock, Shepherd's Purse, and Wild Radish, all common weeds, and clearing off these early in the year would prevent these pests going on from them to the cultivated crops.

Cabbage and Turnip-root Maggot.

Cabbage Fly. *Anthomyia Brassicæ*, Bouché.

Root Fly. *A. radicum*, Curtis.

Radish Fly. *A. floralis*, Fallen.



1, larva of *A. Brassicæ*; 2, 3, pupæ, nat. size and mag.; 4, *A. radicum*, mag.; 5, nat. size; 6—9, *A. tuberosa*, larva and fly, nat. size and mag.

The attacks of "Cabbage and Turnip Maggot," like those of Wireworms, Daddy Longlegs grubs, &c., are best described, for common purposes, under the common English name, as there are at least three sorts so much alike in appearance, and in method of injury, that it is very difficult to tell them apart.

These three kinds of maggot are all much like the kind figured, magnified above at 1, whitish or yellowish, and legless, tapering to the head and cut short at the tail,—in fact, very like the well-known Onion maggot. They feed in or on roots of Turnip and Cabbage, as well as other plants, and in some cases in dung, and in a few weeks turn to chrysalids (figs. 2, and 3 magnified), from which very shortly a new brood of Flies comes out, which is directly in a condition to lay eggs and start a new attack.

These three kinds are all small two-winged blackish or greyish Flies, all of them much of the shape figured at 4, magnified; the cross lines at 5 give about the real length of the body and spread of the wings.

These three kinds are respectively known as the Cabbage Fly, the Root Fly, and the Radish Fly. The scientific names are given above.

The history of the "Cabbage Fly" is the one which appears to have been most recorded. It is stated* that sometimes the Flies, sometimes the chrysalids (pupæ) of the last brood of the year, live through the winter, and come out in the following spring. Then the females lay their eggs in groups of few or many, as the case may be, at the Cabbage plant, and *always as deep down as possible* at the lower part of the stalk, that is, below the ground. The eggs hatch in about ten days, and the maggots bore into the stems, the parts on which they feed soon beginning to decay. When full-fed the maggots turn to red or gold-coloured chrysalids in the earth, and the whole lifetime in summer, from the egg to the perfect Fly, amounts to about eight weeks, so that there is a rapid succession of attacks,

This is the kind which, together with the Root Fly, has been considered to do most harm, but, from the specimens sent me during the past season and previously, which have been kindly identified for me by the excellent skill of Mr. R. H. Meade, the common kind appears really to be that known as the Radish Fly.

On June 11th Mr. Reginald W. Christy forwarded me specimens of maggots which were feeding on roots of Cabbage, "and doing considerable damage"; over twenty were found feeding at one Cabbage root, and these proved to be maggots of *A. floralis*, the Radish Fly.

The method of prevention will be better studied after noticing the attraction of farm manure (especially when rank and new) for the Flies.

The following note of the method of attack, and also of the great amount of damage caused by Fly-maggot (of which specimens were sent accompanying), is by Mr. John Ward, Rainsdale, Nottingham:—

"Aug. 1st, 1883. I send to-day a box containing Turnip plants affected with maggots. . . . You will observe that sometimes the maggot enters the base of the root and lives there, but in other cases it seems to eat off all the small rootlets that usually spring from the side of the main root, leaving the plant dependent solely on one or two small fibres at the end of the tap-root.

"Sometimes it eats the neck of the Turnip all round until it severs the top from the root. As hundreds of acres in this district are affected with it, some information as to its life-history will be gladly received by myself and fellow-sufferers."

With regard to attack near Gloucester, Mr. J. Cummings, Newtown, Newent, mentioned that this year, for the first time, his Swedes were attacked by a white maggot, and the crop considerably damaged.

* 'Praktische Insecten kunde,' Dr. E. L. Taschenberg, pt. iv., p. 129.

At first the plant appeared checked and stunted, and eventually the bulb went quite rotten.

The land was a Wheat stubble, thoroughly well worked in autumn, and again in spring twice. Farm-yard manure (made principally from fatting beasts), at the rate of twelve to fourteen loads per acre, was ploughed in, and the seeds drilled immediately afterwards, on the flat, with burnt ashes mixed with Proctor's Turnip Manure, at the rate of 3 cwt. the acre.

The seed came up well, and the plants appeared perfectly healthy until after they were singled out, when they began to fail from the attack of a maggot which very much resembled a sheep maggot.

The headlands of the field were not planted till nine or ten days after, and only burnt ashes and artificial manure were used ; these were perfectly healthy.

In the bad attack of Cabbage maggot at Admaston, Rugely, which I am favoured with an account of by Mr. T. Carrington Smith, the spread of the mischief was checked by a soaking rain. This is well worth notice, as whatever effect the sudden wet had directly on the maggots themselves, it would so wash down the mineral superphosphate and the nitrate of soda which had been given round the plants as to run on a vigorous growth past attack, and stop some of the coming attack also by closing up many crannies by which Cabbage Flies about could get down to lay at the Cabbage roots.

On June 15th Mr. Carrington Smith forwarded specimens of Cow Cabbage plants and Cabbage Fly maggots, with the information they were collected from a growing crop, and that, if the progress of destruction continued at the rate it had been going on during the week, there would soon be many gaps in a most promising plot of nearly two acres.

The plants had been procured early in April from Farnham, in Surrey, and got well established before the drought. The land on which they were planted had a good dressing of farm-yard manure, and 6 cwt. of mineral superphosphate in the ridge. There was also a sprinkling of (say) 2 cwt. of nitrate of soda per acre, distributed not all over the ground, but round the plants. Later in the year Mr. Carrington Smith mentioned that, shortly after the above communication, there came a good soak of rain, which seemed quite to stop the spread of the maggots to any other Cabbages.

The plants that were used for filling up the gaps did not seem to be attacked, although no local application was used ; but at the beginning of August 1½ cwt. of nitrate of soda per acre was sown broadcast all over the plot of Cabbages which then covered the ground.

There is doubt in this case whether the eggs from which the

maggots were hatched did not come inside the plants put into the ground on April 16th and 17th. It was remarked at the time of planting that a small proportion of the 12,000 plants were "hollow-shanked," and it is likely enough these might be infested.

It has been found (Rep. of Inj. Ins., 1881) that dipping the plants in a puddle of earth and cow-dung, or night-soil, taking care to smear the roots and stems well up to the leaves with the mixture, is a good method of prevention.

[In the following note observations are given of the good effects of dipping in soot and water. Probably the various applications act in the same way, that is, by choking up the pores along the sides, or *at the tail* of the maggot, by which it draws in the air, and thus stifling it.—ED.]

Mr. David Byrd, Spurstow Hall, Tarporley, Cheshire, notes :—"It has been our practice for ten or twelve years to dip the Cabbage stems in thick soot and water, which keep off the grub. We did this to prevent the Rooks from pulling up the plant to get the small white insects which were to be found on the stems ; now we find it keeps off all pests.

"The loss of a few plants that are taken I attribute to the want of care in dipping, so that the stems did not get their proper share of the bitter protection.

"The dipping of the stems in soot and water is intended to ward off the maggot and other insects by giving a bitterness to the plant. If eggs or maggot were in the stem at planting-time, a good dipping for a few minutes would most likely make the plant unpalatable.

"In May and June last I found the maggot in numbers in the manure under Cabbage and Turnips. By dipping I believe I saved the Cabbage, and the Turnips by sowing artificial manure (guano, 2 cwt., superphosphate, 3 cwt., salt, 3 cwt., at a cost of £2 per acre), which closed in the ridge, and would make the soil untenable to the maggot, and drive it to seek other food."

Mr. Ralph Lowe, writing regarding "Cabbage-root maggot" from Sleaford, Lincolnshire, mentions that in a previous year, after fallowing a twelve-acre field, this was dressed with 3 tons of fresh-burned lime to the acre, at a cost of 33s., leaving a strip of eighteen yards width down the centre of the field without lime, but with 15 tons of well-rotted farm-yard manure per acre. At the proper time the lime was slacked (by means of the water-carts), spread and ploughed in, and the whole field was put in with Turnips. Upon the lime the Turnips were a most excellent crop, rich-looking in the top, the roots heavy, clean, *free from mark of insect or grub* of any kind ; whilst the part that had been manured was far from being so satisfactory.

The following note turns on the help from Rooks in getting rid of the maggots, which in this case the birds seem to have managed without destroying more than the attacked plants.

Mr. Ralph Lowe says:—"I went to inspect a crop of Turnips where the white maggot was at one time threatening to commit extensive damage. The Rooks were persistent in tearing up the plants, and the occupier had in despair taken off the "tenter" with his gun, in which he acted wisely,

"I found that about ten acres had been unduly thinned, leaving about half a crop. But the Rook had done his work well; not only could no maggot in any stage of its growth be found, but not one injured Turnip. Wherever the grub had attacked a plant the Rook had pulled it up, and apparently carried off nearly the whole brood, leaving the Turnips in a perfectly healthy state."

Mr. W. W. Glenny, writing from Barking, September 24th, notes:—"The maggot at the root of the Cabbage has done mischief, and has occupied my attention to some extent. It seems that the only way to make circumstances disagreeable would be to dress the land with gas-lime, common salt, soot, or kindred substances that might by their pungent nature be obnoxious to its presence.

"At this time one field of mine has a good coat of refuse lime with a view to deterring its visits."

For some reason which it would be very desirable to know, but which at present is not clear, the Cabbage-root maggot does not appear to be known as a pest in the great Cabbage-growing district close to Hounslow and Isleworth. I have never been troubled with it at the roots of either Cabbage or Turnip in my own garden, but possibly constant applications of lime, gas-lime, and experimental chemicals of various sorts may account for its absence here.

In regard to the neighbourhood I have the following communication from Mr. John Wilmot, Derwent Lodge, Hounslow:—"In answer to your inquiry respecting the Cabbage Fly maggot I am pleased to say I know very little about it, and am at a loss to understand our escaping from its ravages. I find that land in the highest state of cultivation is quite as liable to these pests as land not so well cared for. . . . I believe gas-lime to be the only practical cure for the maggot tribe that infest our Brussel Sprouts, Broccoli, and Cabbage tribe."

Information was also sent, on July 27th, from Ashford, Kent, by Mr. Hart, of Park Farm, Kingsnorth, that whole fields of Swedes were in course of being destroyed by a maggot at the root.

Likewise great destruction to Cabbage, by means of "white worms" at the root, was reported from Carnforth as taking place in that neighbourhood.

A maggot, which on examination proved to be Cabbage-root maggot, was also reported from Stanton-in-Peak, Bakewell, as infesting a crop of Swedes, and attacking, though in a lesser degree, common Turnips sown in the same field; and, going further north, Mr. Robert Service, Dumfries, mentions the attack as present in that neighbourhood early in the season.

Looking at the various localities given, the attack both to Cabbage and Turnip appears to have been prevalent over the country from Glasgow to the South Coast.

The following observations on attack of Cabbage and Turnip Maggot in North Britain also point to it being fostered by large application of farm manure, and checked by the application of lime, gas-lime, or artificial manure.

Mr. J. Spier, Newton, Glasgow, notes:—"I was greatly annoyed by the Turnip maggot in 1881. My crop was Golden Ball for early bunching for table use. They were manured with stable-dung in the drill, and sown in two rows on the drill.

"During June the maggot made such havoc among them as to reduce the available plants to about half a crop. That same season the maggot was tremendously bad on all Cabbage plants throughout the south-west of Scotland, many plots being almost destroyed. My own were worst on the heaviest-manured pieces."

Mr. George McKinlay, The Gardens, Kilconquhar, Fifeshire, notes the attack of the Cabbage-root maggot as almost certain to be troublesome to the grower if he is obliged to use fresh farm-yard manure. Such had been his own case in the past season; consequently the Cabbage and Cauliflower plot had to be replanted three times.

Owing to these attacks, when the sun shone out bright on a brake of Cauliflowers which had looked well up to this time, thirty to fifty would droop, and when pulled up were found to be attacked by maggot.

The remedy found most effective was some lime-shell put into a barrel of water, and allowed to remain forty-eight hours (when it was quite clean), and then applied to *each plant*, as by taking them straight forwards the pest is found to be stamped out.

In regard to my enquiries regarding prevention of Cabbage-root maggot, Mr. Boyd, Callendar Park Gardens, Falkirk, replied that where he had used gas-lime he had been free from attack, whilst at the other places where it had not been used the attack was very bad.

He mentions:—"In one instance I lost the whole crop of four rows of Cauliflower, and I am satisfied you are right about farm manure attracting the Cabbage Fly, as the four rows of Cauliflower were grown between the Asparagus beds, and in early spring the manure that covered the beds was raked off and dug in between them

and the Cauliflowers planted. Other three rows on another piece of ground, well-manured, seemed likely to go off altogether, and when I pulled up a plant I found the maggots in great quantities piercing the stem and roots. I at once applied a watering of guano (in the proportion of two handfuls of guano to a four-gallon can of water) to each plant; and whether it was the guano or not I cannot say, but after that not one went off, and they are remarkably fine.

“My other crops of Cabbage, Cauliflower (and also Carrots and Onions) are all clean, and the reason, I believe, is the ground being dressed with gas-lime.

“I am never without gas-lime, and I believe it to be one of the best friends farmers and gardeners have, both as a clearer out of pests and as a manure.”

The notes of Mr. J. Whitton, from The Gardens, Coltness Wishaw, N.B., show little injury from Cabbage maggot on a system of manuring with only a small amount of stable manure and additions of artificial manure as required. He mentions the material applied is never manure in a rank condition; it is a mixture of short grass, &c., off lawns, and the straw and droppings from the carriage-horse stables. This is well mixed and rotted during the season, and requisite addition made by applying artificial manures to all crops during the growing time. “Generally we do not suffer so much by the Cabbage maggot as many of our neighbours, the only plants that suffer being the early lot of Cauliflowers and Brussels Sprouts, which are sown in heat, pricked out in frames, and finally planted with trowels. Plants sown in beds and drawn therefrom, and planted with a dibble, rarely suffer here. When the plants are fairly growing they get a dressing of guano, or are watered with liquid manure from the cow-house, and when the plants nearly meet in the rows they get a dressing of nitrate of soda.

“That is my usual treatment of the Brassicas, and we never fail in producing satisfactory crops of all sorts.”

It will be noticed that one thread runs through almost all the above observations, and that is attack being the worst where farm manure (especially rank fresh manure) was used. Likewise, that where land had been treated beforehand with chemical dressing thoroughly obnoxious to the maggot, such as gas-lime, there was little or no attack.

There is no doubt that gross feeders like Cabbage and Turnips need plenty of farm manure, but it is badly wanted that some methods should be made out by which manure might be treated and applied so as not to attract crop flies.

The maggots of these flies live on vegetable matter for the most part, but also in rotting material, &c. Farm manure, which is in

great part of rotting vegetable matter, appears to attract the flies to lay, and the maggots from the eggs go on thence to the root. This appears to be the case, judging by the notes sent in by our own agriculturists during the last few years; also by continental observations.

Where there is fresh manure there are three points to bring attack: the smell to attract the flies, and the damp soft material for shelter, and food, as far as we see, for the young maggot.

It may be submitted whether in field cultivation of Cabbage a good dressing of lime given directly after the plants are put in would not be very serviceable. The plants are often merely carelessly set up in the hole, and a dab given on each side by the dibber, so that the root and the manure are both much exposed. If instead the workers were obliged to put in the plant properly, and a handful of lime was then thrown round each, there would not be nearly so much smelling surface exposed to attack, and the lime would give a surface thoroughly obnoxious to the Fly, as the maggots could not live in it.

It will be observed from the notes that dressings of gas-lime beforehand, or of lime, superphosphate, or anything suited to push on growth, but at the same time, as well turned by Mr. Glenny, "to make circumstances disagreeable to the flies," are what we want, and it would be very serviceable if in addition we had notes of how far watering manure in the heap with a weak solution of carbolic acid acts to prevent the heap being the head-quarters of maggots.

A watering of one part of carbolic acid in 100 or 200 parts of water, given once a fortnight to the outside of the heap,—say three times,—would cost little, and would not injure the manure, and might be exceeding likely to keep off Fly laying.

CARROT

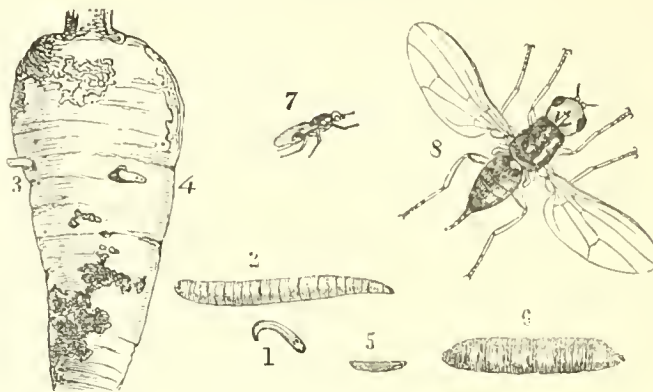
Carrot Aphis or Green Fly. ? *A. papaveris*, Fab; ? *Aphis carotæ*, Koch. (*A. subterranea*, Walker).

The following observations refer to attack of Carrot Green Fly on plants weakened by previous insect injury, mentioned on p. 18.

Mr. J. Speir notes, with regard to his Carrots at Newton Farm, near Glasgow, that "about the time the 'worm' (maggot of the Rust Fly) had exhausted itself, Green Fly began on the leaves, also on the west side, where the crop was weakened by the worms, and it gradually spread over the whole plot, reducing the leafage by at least an average of one-half.

“The last serious attack I had of this pest was in the wet summer of 1879, when the crop was scarcely half an average. How to combat it I have no idea, unless by repeated applications of soot or soot and gas-lime, but, from its speed in reproducing itself, it is with difficulty kept in check in fields of many acres in extent.” *

Carrot Fly. *Psila Rosæ*, Fab.



PSILA ROSÆ.

Carrot Fly. 1, 2, 3, larva ; 5, 6, pupa ; 7, 8, Fly ; all nat. size and mag.

The following information regarding prevention of worm in Carrots on the scale of farm treatment is contributed by Mr. J. Speir, Newton Farm, Glasgow :—

“This season my Carrots, of which I generally grow from fifteen to twenty acres, have been more damaged by the worm than usual. Part of them are after Potatoes and part after Oats, and (like the Parsnips) the greatest amount of damage is done after green crop. In the south-west of Scotland it is generally found that Carrots worm more after a green crop than after a grain crop.

“The reason I presume to be that in the former case (that of following green crops) the land is not so mellow and open, more approaching land which has been carted over in wet weather, which in nearly every case is sure to worm.

“The remainder of my Carrots, in another field about a mile off, low-lying and slightly sheltered after Oats, have hardly any Carrot worm.

“I find soot is nearly a preventive when duly applied, but that it does no good when the pest has made its appearance.

* Carrots are attacked by several kinds of Aphides. Amongst these the *A. papaveris* attacks the leaves. This, according to its condition, is almost black, black with greenish abdomen, or pale green. It frequents Chervil and similar weeds. The *A. carotæ* is green, and is found on flowers-stems of Carrot, also below ground.

It is hardly possible to suggest a remedy, except drenching with soft-soap, which is difficult in field growth ; but turning the surface and dressing with fresh gas-lime in the autumn would be of use in cleaning the ground.

“ I generally apply 10 cwt. of soot per acre, sown along the rows of plants about ten days after singling, for the earliest part of the crop, immediately after for those that are last done, as they are generally a good size before I get over them all, my Carrot-plot being large. I have usually only a small proportion spoiled, for the most part round the edge, or any pieces carted on in wet weather.

“ This year the ten outside drills, adjoining seven potato drills, and then standing Wheat, were badly affected, whilst those having Mangold plants, in place of Potatoes and Wheat on the same side, were free. Any part sheltered or shaded by trees, fences, standing grain, or even by Potatoes, I find to suffer most.

“ If the wind blows anything like constantly in one direction during the middle of July the Flies I find principally approach from the opposite direction, guided, I suspect, by the scent of the plants.”

Probably it is the power of smell (which is possessed strongly by some insects) that attracts the “ Rust ” Fly to Carrot beds that have just been thinned, and consequently give off much scent from the bruised leafage, and which makes it so particularly desirable not to throw the soil more open than can be helped in the operation, or, where it is possible, to water well, so as to close all cracks against the entrance of the Fly.—ED.

Mr. G. McKinlay, writing from the Gardens, Kilconquhar, Fife-shire, gives the following note of the good effect of sowing on holes filled with prepared soil where the land is not suitable for Carrot crops. He says :—

“ I had the ground well manured and rough-dug by the 20th of November, being a strong advocate for autumn digging, so that the soil may get thoroughly pulverized by exposure to frost during winter. On the 23rd of April the ground was forked and raked for the reception of the seeds, which we sow at the above date. The following day a large quantity was sown, but before sowing a Potato-dibber was used for making holes four inches apart and seven inches deep. These were afterwards filled with leaf-mould, sand, and charcoal, a few seeds being deposited in each of the holes, and every other row was filled with pure sand.

“ The seeds germinated satisfactorily, and looked well up to the 20th of June, when Carrot Fly-attack set in, first affecting those sown in the *garden soil proper* (so to distinguish it), which *disappeared* like snow in a thaw. Those that were sown in pure sand, and in the *mixture of sand, leaf-mould, and charcoal*, suffered a *little*, but, after receiving an application of sooty water and paraffin oil mixed, the pest did not make such rapid progress, and at present we are lifting some very fine Carrots.

“ This crop has never thriven satisfactorily in the garden here

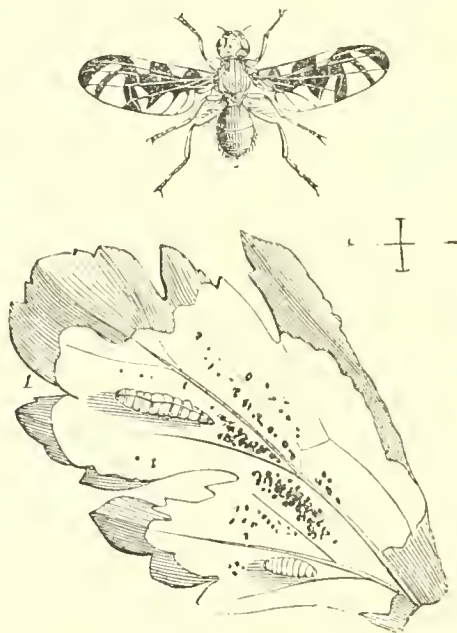
before, and I therefore am under the impression that gardeners who have any difficulty in growing Carrots should adopt the above method."

The following observation sent by Mr. Whitton, from The Gardens, Coltness, Lanarkshire, is a good illustration of the benefit of rotation of crops:—"This year, for experiment, I sowed Onions, Carrots, &c., in a small reserve garden we have, in which Cabbages and Peas only have grown for years. These were treated in the usual way with the others in the main garden (which is the dampest), and not a root was touched."

When once the ground gets infested by any of the various insect-pests it is no easy matter to get rid of them, so long as the plants on which they feed are cultivated.

CELERY.

Celery and Parsnip Fly. *Tephritis Onopordinis*, Curtis.



TEPHRITIS ONOPORDINIS, Curtis.

Celery Fly, magnified; line showing nat. size; maggot and pupa figured in blistered leaf.

One of the marked features of the crop attacks of 1883 was the great prevalence of injury from different kinds of Fly maggots. The method of attack of the Celery and Parsnip Leaf-miner is almost exactly like that of the Mangold leaf-grub, excepting that Mangold

Fly, as far as we know, always lays her eggs on the under surface of the leaf. From these eggs in either case the maggots hatch, and feed between the two sides of the leaf, thus causing first a blister-like appearance, afterwards a brown patch where the skin has been killed by the substance within being eaten away. The maggots turn in a few weeks to chrysalids in the leaf, or in the earth, from which the Fly comes out so soon in summer as to give time for a succession of broods. The Fly is of the size marked by the cross-lines opposite, and handsomely mottled with brown or ochry colour.

The Flies attack both Celery and Parsnip, but, as it is the former that usually suffers most, I have put the observations together under the head of Celery, with reference from heading of "Parsonip."

It will be noticed that at present scarcely any notes have been given of means of prevention, and the wide spread of the attack and great loss from it in market-gardening districts point to a cure being greatly wanted.

One of the earliest notes of the appearance of this Leaf-miner, which has been widely destructive in the past season, was from Mr. C. Whitehead, who, writing on July 10th from Barming House, near Maidstone, mentioned:—"The Celery and Parsnip Leaf-miner is doing immense damage here; hardly a plant has escaped."

Just about the same time the attack of this leaf-maggot was reported by Mr. J. Speir as having been unusually destructive to Parsnips on his land at Newton Farm, near Glasgow, the worst of the attack being on the part of the crop after Potatoes.

It is noted:—"About a week after I wrote to you last (July 10th) my Parsnips began to be affected with large brown spots on the leaves. These large spots look very like the browned parts on the leaves of the Mangolds, and I presume are caused in much the same way. One-half of the crop was dugged in the drill, each drill being 29 in. wide, with two rows on it 6 or 7 in. apart. The other half was manured on the flat and afterwards drilled.

"The former up to a month ago looked by far the best crop, but, owing to the browned leaves, is now far behind the other, as the damage on it is several times greater. The worst damaged lot was after Potatoes last year, the other after Oats."

On Sept. 26th it was further noted that the attack of the Parsnip-miner maggot had turned out most destructive. "Scarcely any season has ever passed without more or less damage being done (generally trifling, however), but this year my whole crop of three acres is worse than lost. At present scarcely a green blade is to be seen, and the land being bare Chickweed is growing rapidly, and, although the present (Sept. 6th) is scarcely the time to use Parsnips, I shall be

under the necessity of raising what crop there is, or the Chickweed will be polluting the whole place with seed.

“Next season, from the time the plants are singled, I propose dressing them with soot and gas-lime every two weeks or so, until about the end of July, by which time I think all danger should be past.

“Up to the present this disease has caused very little loss, the principal loss being caused by ‘Rust’ on the roots. Hitherto my usual remedy, or rather preventive, has been soot applied at the rate of 10 cwt. along the rows, which generally prevents both ‘Rust’ and ‘Burnt leaves,’ but not so this year. The soot was applied about July 10th.” *

On October 15th Mr. J. Mathison wrote me from Addington Winslow, Bucks :—“It may be of some interest to you to know what a severe attack of the Celery Fly we have this year, but for which I can give no reason, seeing we have been almost exempt from it for some years.

“I never saw a more virulent attack ; I plant about 2000 Celery, and not one single plant is free, many of them very badly injured.”

Mr. Turvill also noted on October 18th, from Alton, Hants, that his Celery had been all but spoiled by the Leaf-miners.

The Rev. J. H. White, writing from Weybread Vicarage, in the north of Suffolk, mentions that the chief attack of the season was that of the Celery Leaf-miner, which has been prevalent in every garden in the neighbourhood, and, as far as he can learn, has completely spoilt the crop.

Mr. Glenny, writing from Barking on Sept. 24th, notes :—“The Parsnip and Celery Fly made a grievous onslaught on our fields and gardens about the 14th inst. Large areas and small plots suffered alike, both being equally liable. One field of Parsnips, seven acres in extent, now looks miserable, as if a severe frost had struck the foliage. Naturally the roots will be checked, and a weaker yield will be the result.”

At Detling, near Maidstone, Mr. R. Cooke notices that there was a slight attack of Celery Fly on putting out in the trenches : the first fortnight in September was a time of severe attack. He observes :—“Nothing but hand-picking seems to answer for the Celery Fly grub, and, to judge by the experience of this year, it should be attended to early in the season to prevent bad attack further on.”

The above note of Mr. Cooke’s is about the only suggestion of remedy sent in, and, though at first sight the hand-picking appears to do as much harm as the maggot, yet (as noticed) it gets rid of an enormous amount of *coming* attack, and where Celery is grown

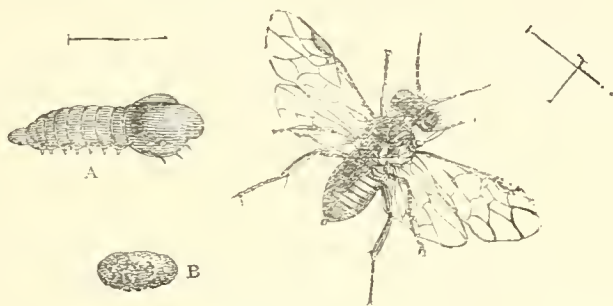
* For further notes on “Rust” see Carrot Fly, p. 18.

only as a garden crop probably is well worth while ; but where the plant is a field crop in market-gardening districts, and the Flies consequently abound through the neighbourhood, it is quite another consideration.

A rapid healthy growth seems the main preventive of injury known at present, and any information as to dressings or sprinklings of prepared ashes on the leafage in the dew of the morning would be very serviceable.

CHERRY.

Slugworms ; Larvæ of Cherry and Pear Sawfly. *Tenthredo*
(*Selandria*) *cerasi*, Curtis.



TENTHREDO CERASI.

A, Slugworm, mag. ; B, cocoon. Sawfly, magnified ; lines showing nat. size.

The so-called “ Slugworms ” are often not recognised at first sight as caterpillars on account of the very peculiar appearance from which they take their name. They are really the caterpillars of the Cherry and Pear Sawfly, and do much damage to the leafage of several trees (amongst fruit trees, especially to that of Cherry, Plum, and Pear) by eating away all excepting some remains of the veins and skin of the under side of the leaf.

The Sawflies are of the common Sawfly shape, but the females are blackish, and the wings sometimes also blackish. They appear about July, and lay their eggs on the upper surface of the leaves. The caterpillars, which soon hatch from the eggs, are at first of the peculiar shape figured, much the largest near the head, and, after just their first appearance from the egg to their last change, of a black or bottle-green colour, and covered with a coat of slime or shiny moisture, which gives them much the appearance of a black slug, or, as it has been remarked, a lump of wet dirt let fall by a bird.

When full-grown they moult off their black slimy skins, and appear as buff or yellowish caterpillars, free from slime, and transversely wrinkled. The caterpillars go down into the ground, like those

of the Gooseberry and Apple Sawfly, and there spin cocoons, from which the Sawfly, unless double-brooded, comes up in the next season.

This attack is not often reported, but I was favoured with two communications regarding it during last season. One was from Mr. C. de L. Faunce de Laune, of Sharsted Court, Sittingbourne, mentioning the great damage that caterpillars of the above kind were then doing by eating the leaves of his young Cherry trees, leaving nothing but the fibre. The specimen enclosed was of considerable interest, for it arrived as a Leech or Slug-like grub, bottle-green in colour, slimy, and repulsive,—in fact, altogether a characteristic specimen of these injurious larvæ as commonly known. Shortly, however, it passed to the final moult, in which the Slugworms are not so often noticed; it slipped off its coat and appeared as a bright orange-coloured caterpillar, dry, wrinkled, and many-footed.

On Sept. 11th I was favoured by Mr. Vaughan Pendred, with specimens of a grub, by which he mentioned the Pear trees in his garden at Streatham had been attacked for three successive years, these being aptly described “as caterpillars more like small Leeches than anything else,” and which eat the whole upper surface of the leaf.

Three years ago a very few appeared, but these were so few that no notice was taken of them. Last year they were more numerous, and this year (1883) they extended their ravages to Plum and Cherry trees.

The caterpillars are described as about three-eighths of an inch long, slimy and repulsive, black above, dark green below; syringing with salt and water had no effect upon them, neither had strong tobacco-water.

The most certain measure of prevention of attack of these Slugworms is (as with Gooseberry Sawfly) just to see how deep the cocoons are lying beneath the infested trees, and then skim off the surface to this depth, and have the infested soil destroyed. This is a thoroughly good preventive of future attack. If the rootlets are near the top still light pricking of the surface and removal will do good.

When the Sawflies are observed *on* the trees it is a good plan to shake them down when they are quiet, in the morning or evening, on to tarred boards or *tarred brown paper*.

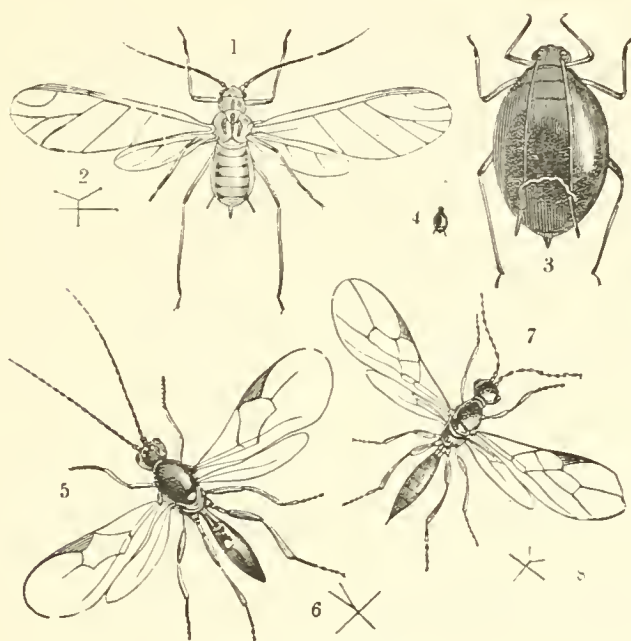
When the Slugworms themselves are at their work of destruction they may be got rid of to a great extent by dredging caustic lime on them, if the application is repeated a few times *at short intervals*. If it is done once only the Slugworm appears little injured, for it can moult off its coat with the dressing thereon, but it cannot keep repeating the operation; therefore repetition of the application kills it.

Solutions of hellebore, tobacco-water, and lime-water are variously

said to be useful, and not to be useful, in getting rid of these grubs, and probably the difference in success of the application depends very much on the above-mentioned power of the grub to moult its skin.

CORN AND GRASS.

Grain Aphis. *Aphis granaria*, Kirby, Curtis; *Siphonophora granaria*, Buckton.



APHIS GRANARIA.

1—4, winged and wingless Aphides, nat. size and mag. (3 and 4 discoloured from attack of Parasite Fly; 5, 6, *Aphidius avenae*; 7, 8, *Ephedrus plagiator* (parasite flies), nat. size and mag.

The Grain Aphis is sometimes very injurious to Wheat, Barley, and Oats; in the present year the only note sent in was from Hagley, near Alcester, where a large proportion of a twenty-acre field of Wheat after Clover layer was infested by it.

Very little (if anything) appears to have been done at present towards getting a hold on the attacks of this Aphis, but, by putting together observation from different countries, there does not seem any reason why it might not be checked.

With regard to its winter history, it was observed by Dr. C. Thomas, late State Entomologist of Illinois, U.S.A., that when winter Wheat appeared above ground in the autumn the Aphides appeared on it. He says:—"Here they work upon the leaves and stalks singly

while the weather is not too cold, but when winter appears they move downwards towards the ground, some of them at least entering the soil and feeding upon the sap of the roots; at any rate I find the apterous ones at this time working upon the roots, but at the same time I find a winged individual above ground. I have also observed them heretofore at the root of the Wheat late in the winter, while snow was on the ground, and what somewhat surprised me, I found them busy at work under the snow, and the apterous (wingless) females bearing well-formed larvæ. I am therefore led to believe that in this latitude the species passes the winter *in other than the egg state*. This will also probably be found true wherever winter Wheat is grown.”*

It is also stated by Dr. A. Fitch, the well-known Economic Entomologist, that “this species is an exception to the ordinary generation of Aphides in that it deposits no egg in the autumn, but hibernates beneath the snow.”†

Now, if we turn to German observations, we find that this Aphis attacks Rye, three kinds of Wild Oat grass (*Avena*), two kinds of Brome grass, the Wild Barley grass, which is a most common weed by dry roadsides, Cocksfoot grass, the Soft Grass (*Holcus*), and Meadow Grass (*Poa*); in short it is known from the above or other observations to frequent all the common corn crops and many of the wild and cultivated grasses.

Looking at these points, and at the creatures having been found to winter on or at the roots of their food-plants, it appears together to account for—or at least suggest very strongly—why Corn Aphides should occur on Wheat after Clover layer, as they would be very likely to be sheltering amongst lumps of grass, and not be destroyed when the ley was broken up.

The habit of sheltering in wild grasses would quite account also for the appearance of the insect in spring or early summer on corn growing near such shelters.

It does not appear that when the Aphis is carrying on its attack in the early stage of the Wheat to the leaves or stems, and afterwards to the ears, any *remedy* can be brought to bear; but, as a means of prevention, probably treatment in breaking up of ley, dressings of lime, gas-lime, lime and salt, brushing, *burning rubbish*, &c., which are advised to clear these fruitful headquarters of our worst pests, such as Wireworm and Daddy Longlegs grub, would be very successful in clearing Aphides from the land before the next crop.

The various Aphides have very little power of removing them-

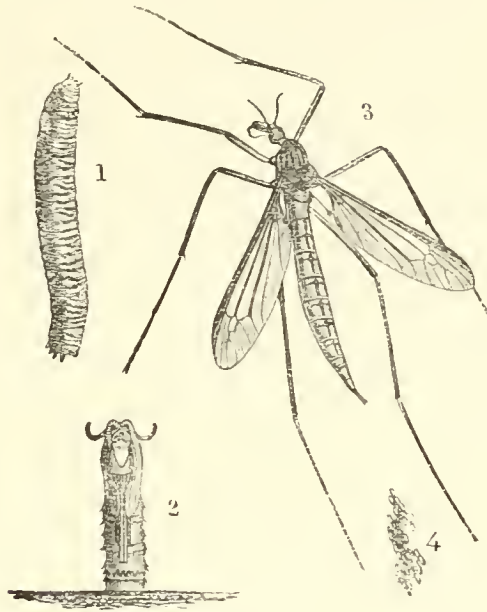
* ‘Third Annual Report on Noxious and Beneficial Insects of the State of Illinois,’ by Dr. C. Thomas, pp. 53, 54.

† ‘Trans. of New York State Agricultural Society,’ xxii., 1863.

selves, and thorough disturbance of their shelters would be almost certainly fatal.

Similarly destroying headlands and breadths of wild grass would do good.

Daddy Longlegs. *Tipula oleracea*, Linn. (and other species).



TIPULA OLERACEA.

1, larva ; 2, pupa-case standing in the ground ; 3, Fly ; 4, eggs.

Amongst the many bad crop attacks of the past season perhaps that of the Daddy Longlegs grubs was the most widely spread and the most lasting.

Early in the year enquiry began as to the nature of the grubs, which were then working at the crop roots, and these continued more or less until with autumn a vast appearance of the Flies gave reason to expect another attack of their grubs next spring.

The attack was reported from many places, and from as far north as Caithness in Scotland down to Brighton. It was injurious to Grass pastures, Oats, and Wheat ; to Beans, Peas, and Turnips ; likewise to Strawberries, and to lawns in public gardens or squares in London and Brighton.

More than one kind of *Tipula* was at work. The smaller, a yellower kind known as the Spotted Daddy Longlegs, which is sometimes considered as still more injurious than the common kind, was noticed by Mr. Fitch ; and the kinds of grubs which were destructive in London may very probably have included those of the *Tipula quadrifaria*, which is stated by Curtis to be especially abundant in London gardens.

But whichever of these common kinds they may have been of, the above figure gives a good idea of the cylindrical, legless, tough, and grey and slaty grubs; and the treatment by which their ravages may be lessened is similar for them all.

It has long been known that the Flies choose damp spots, and shelter in grass or clover for laying, and in the following observations attack is again noted on marsh soil, on wet land, and especially *after Clover*.

The attack is noticed as having been least injurious where the land was well cultivated; and, where severe injury was going on, the same kind of application of fertilising dressings, which was found quite successful in carrying Oats through bad attack in 1882, has proved again successful. For special treatment in bad attack on large breadths of Cabbage land it has been found that hand-picking answered at a paying rate.

I wish also especially to draw attention to the observation of Daddy Longlegs grubs being found in *fold-yard manure*. The first of the following notes refer more especially to the smaller kind of Daddy Longlegs:—

At the end of April I received a communication from King's Heath, near Birmingham, regarding a grub then making great havoc in a large field of Spring Wheat after Beans, and Beans after Wheat. This grub, on examination, proved to be of one of the smaller kinds of Daddy Longlegs, probably the yellow-spotted kind (*Tipula maculosa*), which is, if possible, even more destructive than the common and somewhat larger kind. The grub was reported to be about one inch below the surface, and the heaviest roll used not to have the slightest effect upon it.

A little later Mr. E. A. Fitch wrote me from Maldon as follows:—

“You ask about *Tipula* larvæ in Essex. They are *very* bad; almost all the early Peas are ploughed up, and much of the Wheat has suffered from ‘black grub,’ which appears to be the general local name for these pests. The pretty kind, with a lot of yellow on the thorax, is, I believe, the chief culprit.

“I had eleven acres of White Sickie Peas, sown in November (Nov. 20th), which looked remarkably well until the March severe weather set in; then the grub attacked them, and they wasted terribly every day, until hardly a quarter plant was left. Hoeing did not mend matters, so at the end of March I again drilled the same Peas without ploughing the others up. After rolling and twice harrowing these came up a full plant, but were soon attacked, and there is not near half a plant of the two crops. The early ones are podding (a few almost fit to pick), the later are not in bloom, so altogether the field looks like coming to very little.

“The only two good early pieces about here sold last week at £15 per acre, the buyer to pick. cart, and do everything in fact. I should be glad if mine would come to £15 per acre, and this on the best field I have.

“The only remedy I can suggest is thorough and early hoeing ; nothing else will touch the grubs, which *I believe work down deep in the dung* under the flag of the furrow during the day.”

About May 10th I received information from Mr. A. Bannester, Barling, Chelmsford, that Daddy Longlegs grubs were infesting in great numbers a crop of White Peas on a fallow well tilled and on *marsh soil*.

Mr. G. Brown, Watten Mains, Caithness, N.B., mentions that farmers have suffered in all their crops from insect-attack during the past season. The chief characteristic of the attacks were the myriads of insects in the grub state, and the unequal nature of the damage done. Some localities suffered most severely, whilst others escaped with little apparent damage. He observes :—“*Tipula oleracea* has been very prevalent on clay soils, on corn after rough lea. My attention has been particularly directed to a field upon this farm (Watten Mains) which is very varied in the character of its soil, being clay, peat, and loam alternately. On the clay knolls this grub did considerable damage, which may be accounted for in this way :—The ordinary amount of cultivation necessary to bring the other parts of the field into good tilth was not sufficient to break down the clay into a fine mould. In consequence of this the seed was insufficiently covered up, and (the seed-bed being rough, growth was much retarded) then the grub, attacking the weak plants, almost destroyed the crop.

“Next on the peat, much of the ground was covered by rough grass, which cattle and sheep would not eat. These parts offered an excellent place for the deposit of eggs, and suffered in the spring from this cause, yet, owing to the vigorous growth which generally occurs on such soils, the damage done has been trifling.

“The loamy parts of the field escaped without damage, and have proved an excellent crop. The grub of this insect (Daddy Longlegs) has also done much damage to the young Turnip plants, and Peas also suffered.”

From Levenshulme a note was also sent, with specimens accompanying, of the Daddy Longlegs grubs eating off the Broad Bean plants just at the surface of the ground, so that the plants fell down as if broken off accidentally.

The three following communications note bad attack *after Clover* ley, and mention is also made in them respectively of the large amount of grubs to be found in a given space ; that the Rooks were not found to help in clearing the grubs ; of fertilising dressings

restoring the growth of the crop ; and the very important matter of Daddy Longlegs grubs being found in manure.

The first refers to specimens and information, with which I was favoured by the Hon. Cecil Parker, from the Eaton Estate Office, Eccleston, Cheshire. Mr. Parker mentioned :—" I sent grubs which were destroying a field of Beans here ; the Beans were spring sown on land once ploughed *after Clover ley*.

"The grub attacks the Bean where it touches the ground, gnawing all round the plant, which is from two to three inches high. *Dozens of the grubs are found under a sod*. I may say that no Rooks have been noticed near the field."

Early in May information was asked (with specimens accompanying) by C. E. Bruce Foy, Esq., regarding a grub which was stated by the enquirer to be taking his spring Wheat at Mollington, Banbury, rapidly. He mentions :—" In the last eight days a field that was green all over has hardly a blade of Wheat to be seen. The field was *Clover last year*, ploughed up for winter Wheat, but, owing to the wet season, could not get it in before spring. The few grubs I send [thirty-three, Ed.] I took out of a drill-row, only scratching with my finger the length of two feet, so you may imagine in what quantities they abound. They lie in the ground at the depth of three-quarters to an inch. We have a large Rookery near, only no Rooks go near the field."

Mr. David Byrd, Spurstons Hall, Tarporley, Cheshire, favours me with the following note relatively to carrying Oat crop over attack of Daddy Longlegs by fertilising applications :—

"This year we have a field of Oats of twenty acres (after Clover) sown on the last days of March. The Daddy Longlegs grubs attacked the crop to such a degree that fully half the crop appeared to be taken ; the loss was estimated at eighteen bushels to the acre at 4s. per bushel, that is, a total of £72.

"On May 10th we began to apply the manure we had at hand—

Guano	...	...	1½ cwt.	the acre.
Kainite	...	...	1	„ „
Superphosphate	1	„	„	
Salt	...	...	2	„ „

at a cost of £28 10s., and labour £2 10s. ; together £31.

"The harrows followed the manure drill twice, and a heavy Cambridge roll two or three times over the whole field.

"The crop is now cut, and all traces of the drill-rows are lost in the stubble. The roots have the appearance of having been planted, and many new shoots forced by the manure are plainly to be seen. These give a good head of corn, only not so ripe by ten or twelve days.

“The crop is estimated to be forty to forty-five bushels to the acre, so that we have the crop restored minus the cost of manures.”

The following note from Mr. Byrd as to presence of Daddy Longlegs grubs in the crop from having been brought out in the manure is a confirmation from a direct eye-witness of what is probably often the case. He mentions :—“The Mangolds were attacked by the grub in the leaf, and, having sown Turnips with them, we took out the Mangolds, and have a very promising crop of Turnips, *although the Daddy Longlegs grub was there in numbers*, carried into the field with the fold-yard manure and spread in the ridges.”

Information was also sent in of Barley in Cornwall being destroyed by Daddy Longlegs grubs; and notes communicated by Mr. C. Whitehead of attack (which in this case was identified as that of the *Tipula oleracea*) occurring in Strawberry-beds near Maidstone. Likewise enquiries were received from north, south, and west of London, and also from Brighton, regarding attack of *Tipula* larvæ (Daddy Longlegs grubs) to grass in public gardens, squares, or park-lands, the above notes, taken altogether, showing the widespread prevalence of attack.

The following notes refer mainly to the great appearance of the Flies which took place in the autumn, with some observations as to handpicking :—

Mr. John Wilmot, of Derwent Lodge, Hounslow, notes :—“We have had an enormous number of the Crane Fly grubs this autumn on our Cabbage-seed beds. The plan we adopt is to send women with short sticks, and a small can to put them into, and go carefully along each row; and wherever a plant is eaten off there the grub is sure to be found.

“We have caught thousands of them this season in that way, and thus saved seven acres of Cabbage plants worth at least £40 per acre.”

Mr. Edward Lingwood, writing from Thwaite, Stoneham, Suffolk, mentions :—“My greatest enemy, as regards Green crops, is a brown grub, which I am informed develops to the Daddy Longlegs. This works underground, and I have employed women to taken them out and destroy them.”

Mr. D. Turvill, writing from West Worldham, Alton, Hants, on August 22nd, mentions the unusual amount of Daddy Longlegs in the district as a symptom of coming trouble. He notes :—“My Clovers are literally alive with them. I presume they are laying their progeny in our Clover to feed upon our young Wheats, when they are sown upon it by-and-bye. I shall not be surprised to hear of much thin Wheat later on.”

Mr. T. Hart likewise mentioned, from Park Farm, Kingsnorth, Kent, regarding Daddy Longlegs, “that the Corn crops escaped the depredations of this pest, but the pastures suffered considerably.

Some meadows were literally strewn with dead tufts, which the sheep had pulled up in feeding, and about the beginning of September the *Tipula* Flies swarmed, rising at every step when disturbed in the pasture."

In my own observations of the habits of these Flies, I found all that has been said of their frequenting damp localities and long rough herbage confirmed, even to the point that where there were a few feet or yards of long neglected grass in otherwise sunny pasture, these parts were especially infested by pairing *Tipula*.

With regard to the exact spots for egg-laying, it appeared to me these were chosen with more care as to locality than is usually supposed, and I watched the female selecting a little morsel of dead leaves in a damp path, or a similar collection amongst grass to lay under. From this it occurs that the process of bush-harrowing grass-land, which is known to be serviceable as a prevention for Wireworm-attack, would be even more useful here. The dead leaves amongst the grass and decaying matter generally would thus be thoroughly disturbed, and much that was stirred up to sunshine and air would be too dry for egg-laying on, and likewise, from what happens in other cases, we might expect many of the eggs which had been laid amongst these rotting matters would be destroyed by being dried up when exposed.

I also tried very light sprinkling of gas-lime, about a month from the works, on a garden lawn which was infested by the Flies, and found it acted partially, but not entirely, in keeping them off. Likewise, though the application destroyed some of the grass-blades for a while, it was followed by good growth, and by extremely good growth of Clover, whilst the moss was also generally destroyed; this in itself removed much damp shelter for eggs.

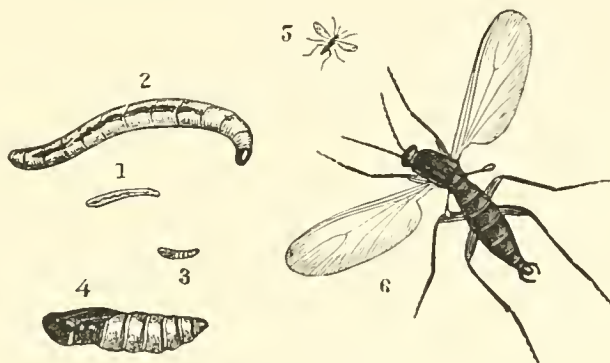
Further, as the males and females are remarkably different in shape, it was noticed that only a small or moderate proportion of the Flies were female, which may give hope for less injury than might be expected from the vast number of Flies that have appeared.

Young-Wheat Maggot. (? *Sciara fucata*).

Early in the year I was favoured with some notes from Dr. A. Voelcker, Consulting Chemist of the Royal Agricultural Society, relative to a small Fly-maggot, which was then attacking some of the experimental Wheat at Woburn.

I am not aware of the attack having been previously noticed, and further information regarding it would be very desirable; therefore, at my request, Dr. Voelcker permits me to give his observations. The

maggots were first sent me on Feb. 12th ; they much resembled those of the *Sciara* figured, and, though they differed from the Daddy Long-



SCIARA FUCATA.

Maggot, chrysalis, and fly ; all nat. size and magnified.

legs grubs in being very small, and also in being white, they were plainly, like the *Sciarae*, very nearly allied to those common *Tipulae* : and the following account by Mr. W. J. Malden, which was kindly forwarded to me by Dr. Voelcker shows their habits also to be very like those of the Daddy Longlegs grubs :—

“ I have found a few more of the grubs which are attacking the Wheat, and have forwarded them. I daresay you will find that they have *worked into the lumps of dirt and Clover roots*. The fields most attacked in this district are after Clover lea, and last year the Clover-wheats were the only ones attacked, and, as the insects were found very much in the lumps of Clover which have been buried, it is likely that the Fly lays its eggs on the Clover, or (for that matter) on any green stuff convenient, and the grub comes to maturity in favourable seasons.

“ There is no doubt that going off of Wheat at this time of year is almost always due to these grubs, as it always presents the same appearance, and I can remember it as long as I can remember anything. The *least pressure kills them*, so that heavy rollings would be the best way of killing them, provided the land would carry a roll or crusher ; but that is in our case impossible at present, and, in fact, there is little land that would carry horses just now.

“ I expect it is owing to these little beasts that Wheat always does best with a firm seed-bed. I think that rolling would answer for killing these better than killing Wireworms. A heavy roll will *kill* them, but it only retards to some extent the other insect from moving freely, though it is also good for pressing the soil well round the root, and letting it get fresh or firmer hold.

“ We did not suffer from these insects during the frosty winters, two, three, and four years ago, but have done so during the last two ;

so I suppose frost prevents them from maturing, or makes the ground too hard for them to travel through."

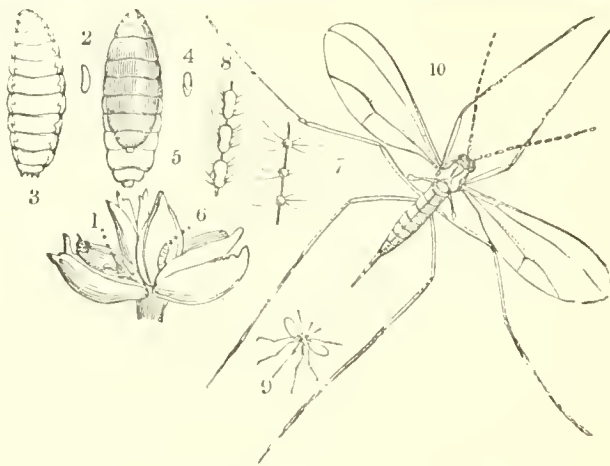
I am not able to identify the species of the two-winged Fly to which this maggot turns, with certainty; but by comparison with specimens from another locality, I believe it to be one of the largest kinds of *Sciara*, of which one species is figured above.

The grubs of these Flies live mainly on vegetable matter, and are to be found, amongst other places, at decayed roots of vegetables, and also in some instances amongst old perishing stems, and have been found feeding there on the remains of gnawed rubbish abandoned by other insects; but they are also to be found in putrid matter of various kinds, and in *dung*.

From these notes of their habits, and the observations given of the grubs being found in Wheat after Clover lea,—and "very much in the lumps of Clover which have been buried,"—they appear to be exceedingly like the Daddy Longlegs grubs in their habits and nature, excepting that they are so tender that they can be easily crushed. Probably the same measures of prevention would serve, and as the *Sciara* are particularly attracted to putrescence and perishing rubbish, thorough dressings of hot lime (or gas-lime in autumn, where the course of operations allowed of the application) could not fail to be of service.

Further notes as to this little Fly would be very desirable, in order to complete its history and identify the species.

Wheat Midge; Red Maggot. *Cecidomyia tritici*, Kirby.



CECIDOMYIA TRITICI.

1-6, larvæ, nat. size and magnified; 7 and 8, part of horns, magnified;
9 and 10, Wheat Midge, nat. size and mag.; infested floret.

I am favoured with the following notes regarding the Wheat Midge, by Mr. Russell Swanwick, from the Royal Agricultural College Farm, Cirencester:—

“On Sunday fortnight (June 17th), I first observed it, about three or four days after the Wheat-ears began to appear. It was then flying about, resting on the heads and depositing its eggs.

“The day before yesterday (July 1st), I examined some heads, and found a good many very small Wheat Midge grubs crawling about, chiefly inside *the outside chaff*, but very few actually attacking the grain, which was just beginning to form. There were a large number of Wheat Midges flying all about amongst the Wheat-stalks, but being rather early in the evening they had not mounted to the heads.

“I then searched the hedge-sides, amongst the grass, and found it as full of them as the Wheat. Wishing to know whether this was their hatching-place, or whether they came from an adjoining field, which is now Clover, but which had been Wheat the previous year, I went into this field, and at once observed a cloud of Midges rise when disturbed, which on closer inspection proved to be Wheat Midges. I should estimate them as ten times as numerous as in the Wheat.

“Here in all probability was their hatching-ground, and these Midges were about to make their flight to my adjoining field of Wheat. A number of old Wheat-chaff scales were visible on the ground, and the Clover-roots looked delightful cover for the chrysalids.

“In order to fortify our conclusion that this was the hatching-ground, we next examined a field of permanent grass, just ready for cutting, to see if there were any Midges there, but after a good deal of time spent we could not find more than one or two, probably blown over from the adjoining field.

“We examined some dung-heaps, thinking the hatching might be taking place there, but, though there were lots of other Midges, we could not make sure of a Wheat Midge.

“This certainly goes far to prove that it hatches wherever it falls at harvest-time.

“I have been in the habit of sowing my grass-seed with the Wheat crop, so as to keep my Barley free of grass, and hence obtain a better quality; it is possible that this custom may have rendered me more liable to the Wheat Midge attack than if the Wheat had been sown without seeds, and the stubble had been ploughed in. It would be very interesting if some evidence could be collected on this point of sowing seeds with Wheat, and the coincidence of worse attacks of Midge.

“I daresay there may be districts in which the true four-course system—of Barley, Seeds, Wheat, Roots—is strictly adhered to, and it would be a most valuable piece of information if the attacks of Midge were found to be less in those districts. What I fear is

that the Midge-grubs can feed and come to maturity in some other food than Wheat."

Prof. Wrightson also noted the prevalence of this pest on the land of the College of Agriculture, Downton. On July 20th, he mentioned, "Our Wheat is suffering fearfully from the 'Midge' this season, and I have given up all idea of a good crop. The little maggots are congregated to the number of twenty in one floret, and the grain is shrivelled up to nothing. The long continuance of cold and wet weather gives them every opportunity of carrying on their destructive work."

The yellow larvæ are mentioned by Mr. C. Whitehead as doing much harm in Wheat at Barming, near Maidstone. It is noted, "from 7 to 10 per cent. of the grains of corn are absent from the ears, and the larvæ are found in the chaff."

Mr. Hart, of Park Farm, Kingsnorth, Kent, mentions that he had a little red maggot in all his Wheat, though it was not to an injurious extent anywhere.

The details given in some of the above notes convey information which is very practically useful, particularly if looked at in connection with the most recent observations on the history of these Midges.

It will be noticed that at Cirencester a large number of Wheat Midges were observed flying about amongst the Wheat-stalks in the evening; also the grass at the hedge-sides proved to be as full of them as the Wheat; and further, that on examination of an adjoining field of Clover, which had been in Wheat the previous year, the Wheat Midges rose in great numbers on being disturbed. It is also noted that, after long examination of a field of permanent grass ready for cutting, not more than one or two Wheat Midges were found in it.

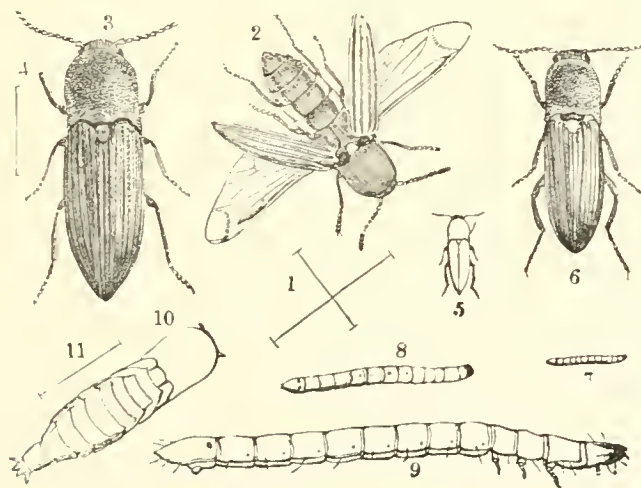
Now, looking shortly at the history of this Midge, as given partly in the German, partly in some of the Canadian and U.S.A. observations, we find that the female lays her eggs, not only on the flowering heads of Wheat, and sometimes those of Barley, Rye, Oats, but also on those of Couch-grass, or Twitch (*Triticum repens*); also that in every stage of its life it is very susceptible of effect from dryness or damp. It comes out in the evening to lay; damp weather at the season of laying suits it, and it has been noticed as frequenting low-lying fields, and also the neighbourhood of hedges.

Likewise observations are recorded of the Wheat Midge maggots (from which the Wheat Midges, male and female, presently developed) being found about the middle of June in clay from a field in which Wheat infested by Midges had been grown the previous year.

Here we have a definite observation of the Red Maggot wintering in the earth at the root of its food-plant, which accounts for it being

found (as above) in Clover after Wheat. The points of fondness for damp localities, and also presence in Couch-grass would conjecturally bear on the large numbers seen in the grass at the hedge-sides, and the very few (practically the absence) in the permanent grass fit for mowings; and the further point to which Mr. Swanwick draws attention of it being his practice to sow his grass-seeds with the Wheat, and therefore the stubble not being destroyed, would be (as we see above) likely to act very strongly in increasing amount of attack. The great point of prevention of this Red Maggot is to give it no winter shelter, which is *naturally* at the roots of the Corn crops or of Couch (and possibly some other) grasses; *artificially* in large chaff-heaps. The chaff-heaps and the rubbish and dust from the threshing-machine can be easily managed; and in the fields a great deal of the Red Maggot might be got rid of by taking the cultivator through the land, and collecting and burning the stubble-roots. Removal, or even rough mowing, or "skirming" of rough grass by hedge-sides before flowering time, would also do much good.

Click Beetles and Wireworms. *Elatér (Agriotes) lineatus*; and other species.



ELATER LINEATUS, &c.

1 and 2, *E. lineatus*; 3 and 4, *E. obscurus*; 5 and 6, *E. sputator*, nat. size and mag.; 7, larva of *E. sputator*?; 8 and 9, larvæ of *E. lineatus*, nat. size and mag.; 10, pupa. Lines show nat. size.

The Report on Wireworm contributed in the previous year appears to leave little more to be said as to the methods of prevention or remedy of attack found to be practically serviceable; but in the following observations one or two points are continued then under experiment, and they refer, in two places, to the important matter of

Wireworm being found in, or apparently attracted by, manure; and likewise allude to field use of paraffin being possible and serviceable.

Mr. H. Marshall, of Poulton Priory, Fairford, confirms observations of the importance of a firm soil, which will prevent the Wireworms travelling, in the following note:—"Thorough cultivation and the use of a *really heavy* 'ring roller' in spring, whenever the land treads hollow, will, in my opinion, prove a thoroughly reliable protection against Wireworm."

He further observes relatively to methods of clearing Wireworm out of the land before putting in a crop:—"When I first farmed this land which I now hold (*viz.*, in the years 1860, 1861, and 1862) I suffered very much from Wireworm. In two fields particularly I had crops entirely swept off in succession. I tried all prescribed remedies (except Woad) without success, when it occurred to me that perhaps a thorough breaking up of the furrow before planting, in lieu of the ordinary method pursued in this country,—of simply dragging and harrowing it down,—might bring the food of the Wireworm, and in consequence the Wireworm itself, to the surface, where the Rook and the Plover might be trusted to deal with him. I tried the plan, and I have never had a *patch* cleared by Wireworm since.

"I fancy the cavities maintained by an unbroken furrow very possibly provide camping ground for other enemies besides Wireworm. The two fields were—one of twenty-five acres, of a naturally hollow soil, which had been a gorse common about twenty or thirty years before it came into my hands, and was drained by me four feet deep as soon as I took it into cultivation;—the other field is sixteen acres, a deepish loam on clay, and was a sour boggy pasture, drained to the same depth and broken up by me, the turf being ploughed down about twelve inches deep."

Mr. Edward Gordon, of Kelton Hill, Castle Douglas, Kirkeudbright, writes, in continuation of last year's observations:—"I think I told you that I had the Wireworms (to the number of several thousands), gathered from a portion of a field on which the crop had previously been invariably destroyed. The result is that this season the Oats are uncommonly good upon it, and no signs of Wireworm.

"I had treated this land with gas-lime without any apparent good, and then spread a heavy coating of farmyard manure on the stubble in the autumn, *which I now think fed the Wireworms*, as they came out very strong in the following spring."

Mr. Carrington, of Creighton, Uttoxeter, mentions that he frequently observes Wireworm in cattle droppings, and that he thinks the Rooks obtain a large supply of their insect-food from that source.

The following note refers to the application of paraffin on a working scale as a field remedy:—

Mr. James Kay, writing from the Bute Estate, Rothsay, N.B., mentions:—"Oats were a good deal wormed here in early spring, more especially in ground ploughed out of lea. . . . I resolved to try the paraffin cure, and got several bags of sawdust, and after having it sprinkled with paraffin it was sown broadcast over the ground. Whether the worms were killed or not I cannot tell, but I am certain they must have been sickened with the fumes of the paraffin, as the crop seemed to regain vigour every day after the dressing."

Mr. J. R. Dunn, writing from Stone House, near Hawkhurst, Sussex, mentions that the land on his property, in a poor part of Sussex, is infested to such an extent that very frequently the whole of the corn crops are destroyed by these pests, notwithstanding the application of pressure by heavy Cambridge rollers and clod-crushers, &c., and treading by bullocks and sheep.

The following experiment as to the effect of Indian Rape—that is, mustard-cake—was kindly undertaken, at my request, by Mr. D. Sturdy, of Trigon, Wareham, to complete my own observations of the previous year (see Rep. 1882). . . . I had found that in the case of Wireworms fed in common rape-cake, and with no possibility of getting at any other food, the worms thrived, and did not appear to need anything else to feed on; but, on the contrary, those fed in Indian Rape- (mustard) cake thrived for awhile, and at the end of about a fortnight some were dead and all the rest dying. This was where the Wireworms had no other food, and to make out what would occur in fairly natural circumstances Mr. Sturdy carried on the experiment in Oats sown in boxes, so that there was choice of food, but still that we might be sure of all points noted. He writes:—

"Two boxes were sown with Oats in March, and when about two inches high one box was well larded with bits of the Currachee Indian Rape-cake you sent me: the bits were about the size of hazel-nuts. Twenty Wireworms were then put into the Oats with the Rape-cake and twenty into the Oats without, and so they were left. The Oats with the Rape-cake flourished exceedingly compared with those that had none, and the former (the Rape-cake Oats) were scarcely touched by the Wireworms, while the latter were a good deal injured. This day (May 1st, 1883) I turned out the Rape-box, hoping to find all the Wireworms *non est*, but instead I found everyone looking fat and well."

My own experiment had shown that the Wireworm in no way suffered from feeding on Rape-cake. Mr. Sturdy's shows that however bad the Mustard-cake may be as a compulsory diet, yet that where there is other food the Wireworm will not suffer in health from the presence of this special kind, and the observation certainly

confirms (if confirmation is needed) the view that Rape-cake acts by fertilising and helping the plant-growth, and also drawing away the Wireworms from the plant, but not by injuring the Wireworms.

BIRDS.

DEPREDATIONS OF SPARROWS; FOOD OF BIRDS GENERALLY, &c.*

During the past season I have received a good many communications relatively to encouragement or destruction of birds. Some correspondents take one view, some the opposite one of the subject; but I would submit that it is quite impossible to gain any well-based views on the matter from only a few observations of the apparent habits of solitary specimens of the living birds.

We need either to have observations of their habits in such numbers as will show surely what kind they are, and what they are doing, or to have observations taken of the contents of the crop *throughout the year*, as the diet may very probably be different at the different seasons.

With regard to the common Sparrow, I believe, from observations in some of our standard works (which are given after the following notes for comparison), also from other reports or personal observations, and also from the strongly expressed opinion of Mr. J. A. Lintner (State Entomologist for New York State, U.S.A.), who mentions, in his *remedies* for insect depredations, "Levy a war of extermination on that unmitigated nuisance, the English Sparrow";—for all these reasons I believe Mr. Lowe's observations to be hardly, if at all, overstated as to enormous damage being caused by the great increase of this special bird.

Mr. Ralph Lowe, writing from Sleaford, Lincolnshire, draws attention to the great increase in number of these birds, and mischief caused by them both from their attacks to the corn and by reason of their driving away other small birds which are serviceable insect-feeders. Mr. Lowe states:—

"The Sparrow has increased greatly during the last ten years; great packs of them swoop down on the Wheat fields, destroying more than they consume, spilling it over the ground. Every piece of Wheat which I saw this year has had more Corn destroyed by Sparrows than would pay one rent at least. . . . If there are as many Sparrows in other parts of the country as there are in Lincolnshire most certainly one million pounds sterling would not repay the occupiers of land for the yearly loss sustained by the depredations of this

* As the above observations refer most to depredations of the Sparrow on Wheat, I have placed them under the heading of "Corn," &c., though the question of what amount of bird-presence is desirable refers to all our crops.

most quarrelsome pest, and they render, so far as I have been able to ascertain, not the very slightest service.*

“They prevent the increase of Swallows, and have literally driven all our soft-billed insect-eating birds from our gardens and orchards. The Flycatcher has gone; the Tree Creeper, the Peep, the Minor Warblers, most of which lived on *the eggs* of moths and butterflies, I have not this year seen a specimen of; whilst the grub in the Celery increases year by year, and the teeming thousands of Daddy Longlegs, and all kinds of moths and butterflies, give a pretty correct warning of what we may expect next year.”

The presence of the insect-pests mentioned above depends also on other circumstances besides amount of bird-presence; but to return to the Sparrow question. Mr. R. Lowe gives the following observation from examination:—

“Seen following the plough, they were found to be feeding upon Turnip-seed that had not vegetated; seen upon the young Barley, they were found to be eating Red Clover and Trefoil-seed; examined to find what they were doing in Swede-Turnip field just bursting into flower for seed, it was discovered they were feeding on the young unopened buds; *one* bird had eaten a green caterpillar.

“In order to find if this bird really fed its young on Aphides,” Mr. Lowe says, “I had a large quantity of young examined: not one, from those a day old to those ready to quit the nest, had eaten anything but Wheat. This was on a farmstead where Wheat or Wheat-straw was always accessible. In towns or on grass the case might be different; I cannot tell.”

Mr. Lowe also mentions that he had one or more Sparrows killed every week for the whole year; for fifty weeks they ate Wheat; for two weeks they ate buds of fruit trees.

The observations on this bird in Yarrell’s ‘British Birds,’ vol. i., state that “their young are fed for a time with soft fruits, young vegetables, and insects, particularly caterpillars”; likewise that, “as summer advances, and young birds of the year are able to follow the old ones, they become gregarious, flying in flocks together to the nearest field of Wheat as soon as the Corn has sufficiently hardened to enable them to pick it out; and here they are for a time in good quarters, but when the Corn is housed and the field gleaned, their supply being thus cut off, they return to the vicinity of houses to seek again the adventitious meal which the habitations of men are likely to afford them.”

In the notes of Mr. A. Hepburn, quoted as those of a practical naturalist, in Meyer’s ‘British Birds and their Eggs,’ it is mentioned:

* [They destroy some amount of caterpillars in nesting-time (*vide* Yarrell’s ‘History of British Birds,’ and Meyer’s ‘British Birds and their Eggs,’ &c.).—ED.]

—“ A long series of observations induces me to assert that with us they prefer insect-food, when it can be procured, but at the same time they like to vary their diet at every season with grain.” It is likewise mentioned in the same passage, “ Turnip-seed is chosen food.” Likewise :—“ In August, just when the grain begins to ripen, they assemble in vast flocks, and, if not carefully watched, will soon commit sad havoc in fields of Wheat, Oats, and Barley ; indeed, the crops are never safe from their rapacity till carried into the yard.”—‘ British Birds and their Eggs,’ by H. L. Meyer, vol. iii., pp. 70, 71.

I give the above quotations as being from standard works of authority taking a fair view without bias to either side of this difficult subject, for in the general remarks sent by amateurs, neither agricultural nor ornithological, on habits of single specimens, there is sometimes reason to doubt whether the *right bird was observed*, and again the correctness of the observation has not been proved by examination of the crop.

I can bear witness myself to seeing a piece of Wheat near Isleworth so utterly ruined by legions of the Sparrows, which swarm amongst the neighbouring villas, that it was left uncut.

As far as my own opinion goes with regard to this special bird, there is great occasion to check its increase round villages, large farms, and in various places where, in consequence of there being a good supply of food and shelter, it has become a downright pest, and needs serious attention.

The general bearing of the question of bird-life on insect-life appears to be this : birds do a great deal of good by clearing off eggs, caterpillars, and insects ; some birds take one kind more than others. Pheasants are fond of Wireworm ; Titmice will clear some of the Gall-fly grubs out of the galls, and so on. *If bird-presence was diminished below the regular average we should suffer greatly.*

On the other hand, birds in their insect feeding destroy many of the kinds which are *carnivorous, or which live as parasite grubs within crop insects*, and in this way they do not help us, quite the contrary ; and likewise, as very few birds are wholly insect-feeders, we have to consider what the *rest of their diet is* (as well as other practical bearings), and I believe that *if the birds were allowed to increase above the regular average we should certainly suffer.*

It has been objected that the words “ average amount ” or “ disturbing the natural balance ” are vague, but I believe that all practical agriculturists know well what is the common amount of different kinds of birds ; and, as far as my own personal views go, I believe that it is very hazardous to disturb this (*unless there are very peculiar circumstances to warrant it*), either by broadcast destruction or by artificial measures of protection, such as putting up nesting boxes, &c., for insectivorous birds, as Starlings, Titmice, &c.

When birds, such as Sea Gulls, &c., come temporarily in great flocks on ploughed land, or pasture, or on trees, they should on no account be molested; they have come to clear off special attack, and when their work is done they will go. But this is a very different matter to keeping up a kind of poultry-yard of small birds which day by day have got to be fed.

GOOSEBERRY.

Gooseberry and Currant Sawfly. *Nematus Ribesii*, Curtis.



NEMATUS RIBESII.

Sawfly caterpillar; cocoon, mag. Sawfly, mag.; line showing nat. length.

The first of the following observations notes attack of Gooseberry caterpillars, and the difficulty of getting rid of the creatures when present; the others refer for the most part to the benefit of dressing with lime or gas-lime, or stirring or clearing away the surface-soil beneath. By these means (as shown in previous Reports) the caterpillars, which spend the winter in cocoons a little below the surface under the Gooseberry bushes, are killed or carried away, and thus the first batch of Sawflies, which would have developed from them in the spring and started a new attack, are got rid of.

Mr. Ellis Lord, writing from Netherton, near Heywood, Lancashire, mentions:—"Last year I was so troubled with them on my Gooseberry bushes as to destroy the crop; and, with the promise just now of plenty of fruit, these pests have made their appearance.

"We have syringed the bushes with plenty of water,—with water and petroleum oil even,—rinsing them about an hour after with plain water, and are trying soot under the trees. Enclosed is a specimen taken this evening, evidently as vigorous as ever."

At Watten, Caithness, Gooseberry Sawfly is noted by Mr. G Brown as having made its appearance in a good many localities. He mentions, as before, "that the principal cure used is hellebore, either infused in water and laid on the bushes by means of a common whitewash-brush, or dusted in the form of powder on the leafage; but the latter method is of no use if heavy rains follow, as it washes the tree clean of the powder before the caterpillar can get enough to annoy it.

"Year after year these attacks occur, and nothing in the shape of prevention is ever attempted; dressing with quick-lime, *and clearing away the earth beneath the bushes*, seems to be the best and surest measure."

Mr. T. Boyd mentions that at Callendar Park Gardens, Falkirk, he is now always free from Gooseberry caterpillar. He mentions:—"I dress over all my Gooseberry ground with gas-lime in early spring before forking over the soil, and have not seen one of these caterpillars for three years."

Mr. T. Hart, of Park Farm, Kingsnorth, Kent, writes as follows regarding the use of gas-lime to check Gooseberry grub:—"In a previous communication I believe I expressed doubts as to benefit derived from gas-lime. I must now correct that, for I am now satisfied that I have benefitted by the application of gas-lime between my bushes. Grubs there certainly have been, but, whilst they have almost stripped other bushes of their leaves, those on the dressed ground are little the worse for the attack."

Mr. Arthur Ward, writing from The Gardens, Stoke Edith, notes:—"Currants and Gooseberries out in the open garden have kept quite free from caterpillars (on the *open ground*); this I think was owing to the trees being dressed with lime early in spring. We have had very fine crops, and the flavour is excellent. Currant trees on the *wall*, which were not dressed with lime, were attacked. The attack commenced at the bottom of the tree on the leaves nearest the ground."

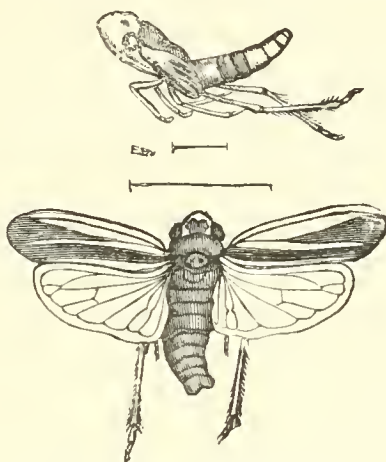
At The Gardens, Coltness, Lanarkshire, Mr. Whitton notes there was a sharp attack of Sawfly caterpillars on Gooseberry bushes, but it did not last so long as usual, as the cold wet weather in July probably checked them. A dressing of hellebore was given during the rainy weather, which speedily checked them.

HOP.

Hop Aphis. *Aphis (Phorodon) Humuli*, Schrank.

For these observations the reader is referred to the Appendix, as, for convenience of early distribution to contributors, the notes were printed before the rest of this Report, and consequently had to be paged separately.

Hop Cuckoo Fly, Frog Fly, or Jumper. *Euacanthus interruptus*, Linn.



EUACANTHUS INTERRUPTUS.

Hop Frog Fly, and early stage of the same, mag., and lines showing nat. size.

The following observations on Jumper, Cuckoo Fly, or Frog Fly, as it is variously called, seem to me to point to the yearly attack being begun by the young “Jumpers” coming up from the ground, or shelters in the ground of Hop-hills, where they had been recently hatched, or from crannies in old Hop-poles; and Mr. G. Turvill’s note of the appearance of the Cuckoos in a Hop-ground which had been free from attack until poles from a badly-infested garden were brought to it, is very interesting.

Whether the autumn females live through the winter in nooks and crannies and lay in the spring, or whether, as I incline to think, eggs are deposited in bark or stems, or in other secure spots, is not yet proved; but, from the observations of these insects being found in a very minute state first early in the season, and also first at the base of the plant, it is probable something might be done to check their upward journey.

Paraffin (see p. 39), or any application thoroughly obnoxious to the insect, which might be so sprinkled in a dilute state on sawdust,

ashes, dry earth, or anything else which could be readily shovelled amongst the stems without doing them harm, would be a great deterrent.

Mr. D. Turvill, writing from West Worldham, Alton, Hants, mentions:—"Cuckoo has been very troublesome again this year. 'Catching' has been resorted to again by planters. The eggs are hatched in the ground, I believe, because the tiny things, no bigger than a Hop Louse, are observed *at the base of the plant* first. They change their skins very often, and when very small."

The following note confirms the view of the Jumpers coming up from the earth by the Hop:—

Miss M. Golding, writing from Ivy Hatch, Sevenoaks, on July 28th, notices an attack having begun on a Hop-garden there, "at present affecting the lower branches only." Some Hop leaves were enclosed to show what were believed to be the remains of the insects which had caused the attack, which proved to be cast skins of *Euacanthus* that is, "Cuckoos" or Jumpers, and one more advanced specimen.

Mr. G. Turvill, of East Worldham (also Alton, Hants), noted on May 28th, on inspecting some Hop-bines carefully, that they were attacked by Cuckoos in a microscopic stage. Further on (May 20th) he mentions:—"I also caught a few specimens of the Cuckoo Fly, apparently in two stages of moult, and submit the red-banded one has passed the second moult, as I find the very smallest (almost microscopic) of a dull ash-grey, without (to the naked eye) any bands; second larger, of much the same colour, but banded; and third, larger still, beautifully coloured and marked. The old cast skins remain whole and intact, adhering to the under side of the leaf. At present I have been unable to ascertain where and how the Cuckoo passes the winter, whether in the crevices and under the bark of the poles or in the ground; but the following fact has just come under my notice:—A grower had a plantation infested by 'Cuckoos'; it was grubbed, and the poles removed during the winter to another ground, which up to this time was free. It is now as badly troubled as the old garden."

Mr. Turvill further observes:—"From my own experience the attack is strongest in alternate years. In my own grounds they made a first appearance in 1876; a few solitary specimens in 1877 did slight damage; in 1878 they completely infested and destroyed about two acres in one garden; in 1879 they almost disappeared, and the crop was good (for a bad season); in 1880 they attacked the whole garden, scarcely a plant reached the top of the pole, and the crop was a failure; in 1881 'Cuckoo' was scarce, and the crop good; 1882 'Cuckoo' was numerous, weakening the plants, and was followed by 'Fly' and total destruction of crop; but, when the plant was hope-

lessly black and leaves fallen off, the ‘Cuckoo’ could not be found, and we were hoping he had removed; this year (1883) he has again appeared, but at present (May 30th) it looks as if the plant would be master.

“The injury done by them is by puncturing the bine; after they have left it the sap exudes in beads, and the plant is literally bled to death.”

The appearance of the Jumper, in connection with the use of old poles, is worth further observation, as, if found to occur as a frequent thing, it might perhaps be stopped at a moderate cost, by different treatment of the poles, or more careful tarring of the ends.

“**Strig**” Fly Maggot. (Scientific name not ascertained at present.)

In the course of 1882 I received information from various observers regarding a maggot which did much harm by tunnelling passages in the stalk or strig of the Hop cones.

The damage was plainly to be seen, but I failed in any case to find the maggot within; this year, however, we have advanced so far as to find that the maggots are *certainly* those of some kind of *two-winged Fly*.

On August 31st Mr. W. J. Goodwin (who had communicated with me on the subject in 1882) reported from Winfield House, Cranch, near Sevenoaks, that there was again a bad attack of maggot in the strig of the Hops, and specimens of infested strigs were forwarded. These were tunnelled by the maggots, some of which were then at work in the strigs, and, on laying them on the table, the maggots shortly were very plainly to be seen, for they came out from the cones, and, joining head and tail, skipped (for their size) with tremendous leaps all about in the fashion of cheese-maggots. These maggots were white, very numerous, and certainly of some kind of two-winged Fly.

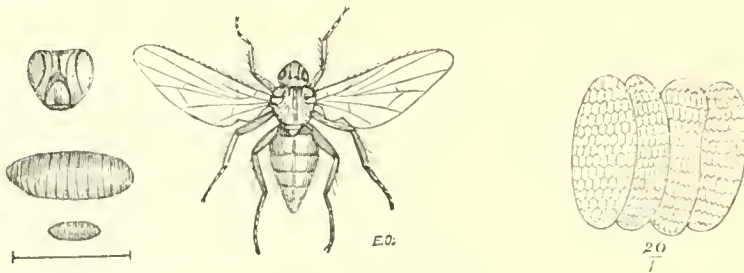
The only kind of two-winged Fly which I find mentioned as injuring the Hop by the minings of its maggot is the *Agromyza frontalis*, one of a genus of “small to very small” Flies, of which the maggots live generally by “mining in leaves or in the pith of plants, and which are all vegetable-feeders.” But I do not find that mention is made of any kind of *Agromyza* maggots having the power of skipping about, which is a most marked characteristic of these strig maggots.

In turning to the genus, which includes the Cheese Maggots (*Piophilæ*), I find that there is one small kind which is noted as having “the habits of an *Agromyza*”; therefore I conjecture we may very likely find this maggot, which is so injurious to the Hop-cones, is the

larva of the little *Piophilus pusilla*, and, judging by the great attraction decay has for many of these Flies, may very possibly be attracted in part by the richly-manured land. However this may be, I have so many specimens of the maggots carefully secured in the earth in which they buried themselves that I shall hope to be able to name the species in the coming season.

MANGOLD.

Mangold and Beet Fly. *Anthomyia Betæ*, Curtis.



ANTHOMYIA BETÆ.

Beet Fly and pupa, mag. and nat. size ; head and eggs, mag.

During the past season the Mangold Leaf-maggot has been destructive at various places, but unfortunately scarcely any notes have been sent in of treatment to prevent or check it.

The great point appears to be to gain such a strong healthy growth as may carry the Mangold over attack ; and in the following observation autumn cultivation is noted as having proved serviceable.

Mr. Jabez Turner, of Norman Cross, Peterborough, in reply to my enquiries, favoured me with information that his plan is to use a mixture of farmyard manure, *applied in the autumn* as soon after harvest as possible, and a fair dressing of superphosphate, &c., put on with the seed. He further notes :—" I have never suffered from Fly in a Mangold crop, as I think, if the plants are well fed and nourished, the growth is too strong for the enemy to do much damage.

" I may remark that the crop of Mangolds this season in the Fen district, where many are grown, is very fine, and the plants look remarkably healthy."

This communication, taken in connection with the following (which I am also kindly permitted to use) from the Hon. Cecil Parker, Eaton Estate Office, Eccleston, Cheshire, appear to me to suggest a good deal :—

Early in June I received, from Mr. Cecil Parker, a box containing maggots, together with Mangold leaves, with the information that they were specimens of the maggot then destroying Mangolds in Cheshire. Guano had been ordered to be applied along the drills, and was put at the rate of 3 cwt. per acre, but the weather, being dry at the time, it did no good, and up to September 6th it was still noted:—"The guano did no good; the maggots were in scores in the skins of the leaves, and in consequence there was at that time only about a sixth of what there ought to have been." Later on, however, "the Mangolds filled out considerably, and the crop was heavier than was expected."

On my request Mr. Parker procured me full details of the preparation of the land for the above Mangold crop of six acres, grown after Clover roots, which may be given shortly as—two ploughings, two scarifyings, three rollings, three harrowings, ridged twice; also the application of 3 cwt. of salt per acre, twenty loads of manure per acre, partly from the stud and partly from the farmyard, and, as above mentioned, 3 cwt. guano.

It will be noted that in both cases there was careful cultivation, but in the first the farm-yard manure was given in the autumn, as soon after harvest as possible.

It is nearly sure, from the careful turning over of the soil in Mr. Parker's treatment, that the Mangold Fly cannot have come up from chrysalids in the earth, and, looking at the fact of this class of Flies being attracted by manure, and the grubs being sometimes both manure and plant feeders, it appears worth observation whether there is *more* or *less* attack generally on land which has been *autumn* manured, and where consequently there is neither the rank state of the dung nor the smell from it which is attractive to some kinds of Flies nearly allied to the Mangold and Beet Fly.

But further, it appears from the observations of Mr. J. A. Lintner, State Entomologist of New York, U.S.A., given in his Report for 1882, that he has found three other kinds of Flies either *infesting* the leafage, or has reared them from maggots *in* the leafage of Beet, *besides the A. betæ*, which we know in this country.

One of these species is "very similar" to a kind (*Chortophila conformis*) which mines Burdock leaves in this country; another, hitherto undescribed, has been named *Chortophila betarum*; and the third, which *may have been merely infesting the Beet leaves*, was either the *A. floralis*, Fallen, which we know as feeding on Cabbage and Turnip roots, or the *Phorbia floccosa*, which, if not the same kind, is almost similar.

As yet we chiefly know the grubs of this Fly (the *A. floralis* or Radish Fly, see pp. 10—17) as Cabbage and Turnip root feeders, and as

manure maggots; and the observations are not complete as to it having been absolutely and certainly *reared* from maggots *in* the Beet leaves. But the observations of Mr. Lintner are well worth following up, and I should be greatly obliged to any agriculturists who, in the coming season, would send me pieces of infested Mangold or Beet leaves, by means of which I might rear the maggots to development; and we might thus learn whether we have various kinds of miners on these crops; whether they are kinds which frequent common weeds; and also whether any of them are of kinds which live also at roots or in manure.

Injury from Leaf-maggot to Mangolds is also mentioned at Admaston, Rugely, and West Worldham, Hants; and a note is given by Mr. David Byrd, Spurstons Hall, Tarporley, that "the Mangolds were attacked by the grub in the leaf, and, having sown Turnips with them, we took out the Mangolds, and have a very promising crop of Turnips." In this case *fold-yard manure* had been used in preparing the ridges.

The settlement and spread of this Mangold maggot since 1879 has become such an important matter that I should also be particularly obliged if those who are good enough to communicate with me in the coming season would allow me to have notes of the kind of manure used and date of application, and also of the nature of the preceding crop.

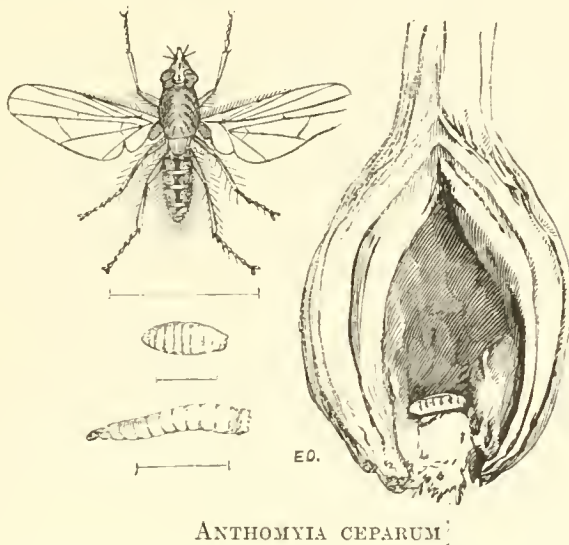
ONIONS.

Onion Fly. *Anthomyia ceparum*, Curtis.

Mrs. Carden notices the Onion Fly as having been most destructive this year in her garden at Endon, near Pershore, Onions and Shallots being both attacked. It is remarked:—"It commences its attack *not* on the leaves, but on the lowest part of the bulb; nothing seems to arrest its ravages." The ravages appear to have been also general in the neighbouring villages.

This matter of the *point* of attack is of much importance in arranging methods of prevention. Minute differences of description of species to which one specific name is given by various writers, likewise *various specific names* being given to what appears to be the *same species*, make it almost impossible to say in plain terms whether we have *two or more kinds of Onion Fly* in this country; but it is very plain that we have *another form of attack* besides that mentioned long ago by John Curtis in his 'Farm Insects.'

This first-observed method of attack was stated to begin by the Fly laying her eggs *on the leaves* of the Onion close to the surface of the earth, from which point the maggots made their way between the leaves into the lowest part of the Onion bulb.



ANTHOMYIA CEPARUM

Onion Fly, maggot, and pupa ; magnified. Pupa in stored Onion. Lines showing nat. size.

This was the form of attack ascribed by John Curtis to the *Anthomyia ceparum*, now named by Mr. R. H. Meade, to distinguish it clearly from *A. ceparum* of other writers, *Anthomyia* (*Phorbia*) *cepetorum*.

In the case of the Onion Fly, which I have repeatedly found attacking Onions when partially uncovered or shaken from the soil by hoeing, the injury began *not from above the bulb*, but below it or at the side. The maggot-entrance had distinctly been made at the base of the exposed bulb, or, if the whole bulb was not exposed, at the side.

The kind that caused this injury was different to the above, but the question of identity is so involved that, beyond saying that I gather it (from the result of minute enquiry and reference I have been favoured with) to have been the *A. platura* of Meigen (? *A. cilicura* of Rondani), I do not enter on the subject of the scientific name.

Various measures of treatment for Onion Fly have been given in previous Reports, but in personal experiment I find that any measures which will preserve the bulb from being exposed above ground, or which will bury it again up to the neck, if exposed in hoeing, &c., are very serviceable.

In garden cultivation earth may be thrown along the rows so that the Fly is perfectly unable *to get at the bulbs* to lay ; and I have found treatment of this sort immediately followed by the eggs being laid at haphazard high on the leaves or dropped on the ground, where they perished, and the Onions consequently escaped attack.

Drawing the earth up over the bulbs, as in earthing up Peas, I have also found to answer well, and, though the first of these two plans is scarcely possible in field cultivation where the crop is broadcasted, it may be suggested, with regard to the second, whether, when the workers are thinning the crop, they might not at the same time draw the soil over the remaining bulbs.

The time when the young crop is thinned is the—or at least one of the—most critical periods, as the bruised, disturbed, plants attract the Fly, the roots are then most exposed, and also are often checked in the growth which might have carried them through attack.

The following information, sent by Mr. W. Harrison from Eskdale, near Carnforth, refers to a successful experiment with soot as a means of checking attack of Onion maggot when in progress :—

“The Onion-bed was about twenty feet in length. The maggots had commenced work from one end, and destroyed three-quarters of the crop. I applied the soot, and washed it well into the ground with a watering-can. I am glad to report that it had the desired effect, preserving the remainder of the Onions.”

PARSNIPS.

For Parsnip and Celery Fly, *Tephritis Onopordinis*, see pp. 20, 21.

PEAR.

Pear Midge. *Cecidomyia nigra*, Meig.

On June 15th I was favoured by Lord Walsingham with specimens illustrative of injury to young Pears, caused by the maggots of a kind of small Fly or Gnat-midge which I am not aware of having been previously noticed as injurious to a serious extent in this country.

The specimens which were forwarded were of small abortive Pears gathered on one of Lord Walsingham's farms in Norfolk. The inside of these Pears were then in process of being eaten away by the small white legless maggots within, and information was sent accompanying that every Pear on the trees from which the samples of injury were taken was infested by them.

These maggots agreed, both in their habits and in the kind of injury they were causing, with those of the Black Gall Midge, the

Cecidomyia nigra of Meigen, and similarly had the power of skipping (like cheese maggots) in all directions, a faculty which they make use of in springing from the Pears in which they have fed, to the ground.

A little earlier in the year (on June 4th) an account of a similar attack, also not previously observed, was sent to me from Llanina, New Quay, South Wales, by Mr. C. R. Longcroft, who wrote as follows:—

“I have sent you some specimens of Marie Louise Pears, of which there was a splendid promise of a crop on two trees, but they are all attacked by grubs within. If you cut one open you will see the culprits.

“The same thing happened last year, causing the destruction of a crop, as well as in addition having destroyed a fine crop of Beaune Bachelier. I observe that the winter Pears have entirely escaped.

“I have not heard of a similar case in this neighbourhood, and, during my previous experience of many years, I never met with or heard of their appearance here. As it concerns fruit market-gardeners, as well as those who have Pear orchards, it may be deserving of notice.”

If the attack is, as it appears to be, from the maggot of the Pear Midge, the history may be shortly given as follows:—The Pear Midge is a very small two-winged gnat fly, not more than a line long, of the same nature as the Wheat Midge (see fig. p. 34), but black or grey, not yellow. The females lay their eggs in the young blossom-buds of the Pear long before they have unfolded, by piercing through the petals or through the side of the bud with their long ovipositor.

The eggs have been found to be from one to twenty in number. They soon hatch and bore into the core of the forming fruit. There they live until they have gained their full size, and have hollowed out most of the inside of the Pear. The attacked fruit is consequently stunted in its growth, decays, and often cracks, and by this means exit is allowed to the maggots, which have the capacity of bending themselves together, and, with a spring, flicking themselves off to the ground, *where they bury* themselves. Sometimes, if the Pears have fallen without cracking so as to allow egress to the maggots, they will remain within for weeks, and then, when circumstances allow, will bury themselves. The further change to the chrysalis and midge takes place in the ground.*

Where attack is found established, of course nothing can be done to save the maggoty Pears, but by carefully looking over the trees, and, where the crop is in reach, picking off and destroying the little stunted fruit, and also by picking up and destroying the small fallen Pears, much future mischief may be prevented. Where the fruit

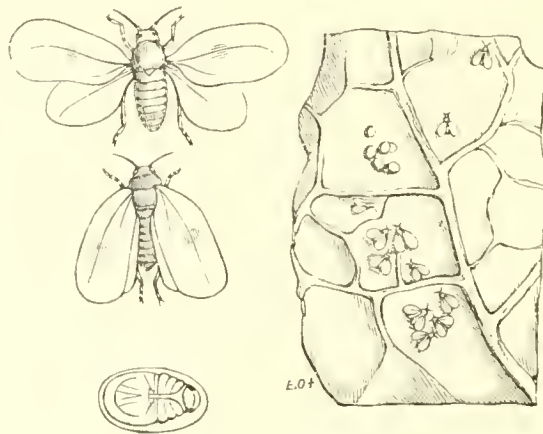
* See Kollar's 'Inj. Insects,' pp. 293—295.

cannot be reached, spreading a coat of quick-lime *on a dry day* beneath the tree and then slaking it would make much of the infested fruit fall, and the lime would be ready to destroy escaping maggots.

In orchards growing on grass-land a deal of infested fruit may be got rid of by having sheep on the ground; they will clear off various kinds of fruit with the contained insects, and I have known them specially partial to fallen Damsons.

Where the roots are not on the surface, it would be desirable to clear away a few inches of the top soil from under infested trees as soon as the stunted and maggoty Pears are down, and treat it in any way that would destroy the contained grubs.

Moth Blight, Snowy Fly, or Powdered Wing. *Aleyrodes*
Phillyrea, Signoret, and other species.



ALEYRODES PROLEPTELLA, Linn.

Snowy Fly and early stage on leaf, twice nat. size. Fly and under side of pupa, 3 much magnified.

The kind of Snowy Fly which is most important practically is that figured above, which infests various sorts of Cabbage. It may be found more or less all the year round, and sometimes occurs in great numbers, which rise like a quantity of minute snow-flakes on any disturbance of the plants they infest. These "Moth blights," as they are sometimes called, lay their eggs in patches on the Cabbage leaves. The larvæ or maggots, which hatch from these eggs, are much like very small white or yellowish scales in appearance, and sticking fast to the leafage, to which they do much harm by drawing away the juices with their suckers.

The various kinds of *Aleyrodes* (see observations on *Aleyrodes* by Dr. Signoret) resemble each other in being whitish, and covered with a kind of mealy powder, from which they take their name, and which is to be found like white dust on the leaves they frequent. Their

white wings are sometimes spotted (see figure), and the bodies are sometimes reddish or more or less spotted with black.

In the larval state they vary both in colour and in sometimes being smooth, sometimes sprinkled over with hairs, tubes, &c.

“They are to be found under leaves and in situations which are sheltered and rather damp; they are less common during great heat than in spring or autumn, but may be found in all stages during winter. In the perfect state they may be found in crannies in bark, or in the ground, or even under leaves; in the condition of eggs, larvæ, or pupæ, beneath the leaves which support them, as *Arbutus*, *Chelidonium*, *Alaternus*, and Cabbages.”*

The common Cabbage “Snowy Fly” is represented above as a general guide to the appearance of those of which the following observations have been given, which are less frequently met with:—

On Sept. 12th information was sent me by Mr. T. B. Woodward from Hardwick Bank, Tewkesbury, of a blight which had appeared in his own and neighbouring gardens during the previous fortnight in the shape of myriads of tiny White Moths, about the size of a flea or gnat, and which were then taking to the Espalier Pears, under the leaves of which they were already setting up attack of their larvæ.

On Sept. 17th further information was given that the Moth-blights were in great numbers on all the Espalier Pears in a large garden, but had not touched any other kind of plant, and a few days later they were mentioned as having appeared in a garden about a mile off; likewise that on a Privet bush, which had been nearly smothered by them, they appeared partly dead, but those on the wall Pear trees were as lively as ever.

This attack is of special interest, as I do not find either by enquiry or reference that any species had previously been noticed as specially infesting the Pear.

A little earlier in the year, on August 18th, I was favoured, by Mr. C. Magniac, M.P., with specimens of another kind, which was then appearing in great numbers in his garden at Colworth, Bedford.

This species of “Snowy Fly” or “Powdered Wing” (which was infesting *Arbutus* of some kind or *Phillyrea*) in the garden, proved to be *Aleyrodes Phillyrea*, which is distinguishable from some other kinds by the small scale-like grubs being set over with short tubes or tube-like growths.

When the myriads in which these little Snowy Flies appear are observed taking up their quarters on trees or shrubs, like the Pear or *Arbutus* mentioned above, much might be done to get rid of them by a thorough drenching, syringing applied by the garden-engine, or (if

* See Monograph on *Aleyrodes*, by Dr. Signoret. Published in ‘Annales de la Société Entomologique de France.’

it should be where there is a force of water on from waterworks) by the garden-hose used with a spreader. The Snowy Flies rise like a cloud on disturbance, and only fly a very little way, and thus many could be fairly drenched down on to the ground, and a sprinkling of lime or even ashes or earth above the wet surface would prevent the revival of such minute delicate forms. If soft-soap and water were syringed at the leafage this would also do much good.

In the case of deciduous trees, like Pears, clearing away the fallen leafage in autumn and burning it would be very desirable. Stirring the top soil well, and putting a good dressing of quick-lime on the surface, would do good, and also brushing the bark with any mixture, or simply with lime-wash, so as to clear out or stifle any of the Flies that might be harbouring in crannies.

Note.—The following observations refer to the benefit to Pears or other standard or wall-fruit trees from various methods of applications of lime, not only such as the whitewash and dusting often used, but proper cementing of walls, &c., so as to remove or destroy dead or live points of shelter and also some amount of the sheltering pests.

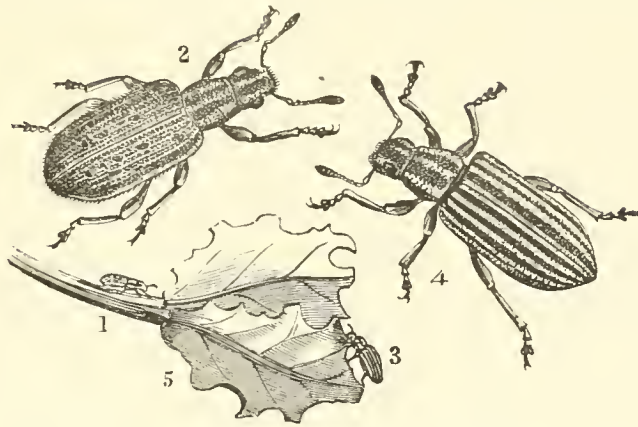
The following note is from Mr. G. Brown, of Watten Mains, Caithness. He says :—“ Pear trees have suffered a good deal during the past years from the attacks of a caterpillar, which affected the leaves in such a way that they rolled up and gradually shrivelled and died.

“ During the spring of this year these trees were taken out from the wall on which they were trained to admit of it being cemented and whitewashed. During this operation the trees received a good dose of the lime-wash, which has cleared off the insects completely, as the foliage has been during the summer quite fresh, luxuriant, and a beautiful green.”

Mr. D. Scott, Ballinacourte, Tipperary, notes :—“ I remark that fruit trees in the garden here are more free from attack since I recommended dusting them in November with quick-lime ; it burns off the moss, removing all refuge for vermin.”

P E A S.

Pea and Clover Weevils. *Sitona lineata*, Linn. (and other species).



SITONA CRINITA AND *S. LINEATA*.

1 and 2, *S. crinita*; 3 and 4, *S. lineata*, nat. size and mag.; 5, leaf notched by Weevils.

In the course of the spring and summer of 1882 the long-needed observations of where the maggots of the *Sitona lineata* and *S. puncticollis* (that is to say, of two kinds of Weevils which often cause great injury to Peas, Beans, and Clover) feed and turn to a chrysalis state were made respectively by Mr. T. H. Hart, of Park Farm, Kingsnorth, Kent, and Mr. R. W. Christy, Boynton Hall, near Chelmsford, and were given, up to the time of preparation for publication, in the ‘Report of Injurious Insects for 1882.’

The following observations by Mr. R. W. Christy complete his observations up to the same time in the season of the year in 1883, in which he began them in 1882, and I prefix a few lines of abstract of the first part of his observations.

In March, 1882, he found the Weevil grubs* present at and much injuring the roots of Clover; these (*Sitona*) grubs turned to chrysalids about the end of May, from which the first Weevils came up about June 20th. The Weevils were exceedingly numerous and injurious in the usual way, by gnawing the roots of leguminous plants, and towards the end of November the new generation of grubs from the eggs of these multitudes of Weevils was working at the roots of the Clover.

Here the observations in the Report of 1882 stopped. Mr. Christy now continues:—

“On Nov. 23rd I examined great numbers of Clover roots, and

* This attack was of *Sitona puncticollis*, which is very like the common Pea Weevil, *S. lineata*, excepting being a little larger, and having a few whitish spots on the fore part of the body near the head, whence the name *puncti-collis*. The maggots of these two kinds of Weevils are about a quarter of an inch long, legless, wrinkled, and whitish, with a brown or ochre-coloured head, furnished with jaws, the chrysalis like the beetle in shape, with the forming limbs folded beneath it.

was surprised to find numbers of *Sitona* larvæ in all stages of growth, some evidently just hatched, others nearly or quite full-grown. This field was noticed in harvest-time to be swarming with Clover-weevils, the platform of the reaper being literally covered with them when the *Barley was being cut.*"

"Dec. 28th, examined several plants of Clover, and in each case found larvæ at the roots.

"Jan. 11th (1883), made a general examination of the Clover fields. We have over fifty acres of Red Clover this year, grown after very different crops and under different circumstances, all more or less affected. In fifteen acres of Clover, grown with Barley, the Weevils were numerous; in fifteen acres, grown with Wheat after summer's fallow, they are not quite so abundant. . . . In no case have I found any pupæ, although full-grown larvæ occur frequently.

"I found several Weevils hibernating in the outside of a Clover-seed stack, and have no doubt they do so in large quantities, as I shook several out of a small bunch of heads."

Looking at the series of observations together there is no doubt that it is these legions of Weevils, many of which are noticed on the platforms of the reapers or on the floors of the waggons, that are the starters of the next attack.

Some of these, as noted below, go into winter quarters down the hollow stubble straws, and in the following spring they come out to feed on the leaves of the Peas or Clover, &c., and to lay eggs and continue their species; but many begin their egg-laying at once.

Mr. Christy noted before that on October 21st the Clover roots were free; now, as observation went on, he found about a month later many of the maggots, some of them just hatched, and these maggots were to be found throughout the winter.

The two following observations also confirm the point of the enormous number of Weevils to be seen at harvest-time, and the fact of the creatures sheltering for hibernation down the stubble straws,—

Mr. D. Turvill, writing of the vast number of these pests to be seen on his land at West Worldham, Alton, Hants, mentions:—"I have been busy carting Peas; these were swarming with Weevils, lying an inch thick in the bed of the waggons, and numbering millions. An inspection of the barn now shows myriads crawling out of the Peas and covering everything, 'as thick as the hairs on a hog's back.'"

On Sept. 25th the Rev. J. C. Clutterbuck, of Long Wittenham Vicarage, Abingdon, mentioned he had just heard that the *Sitona lineata* had appeared in the stubble, taking refuge in the open straws above the joints, and threatening the early-sown *Trifolium incarnatum*.

The above notes, taken together, give a pretty fair idea of the history of these various Weevils through the year. It is scarcely

possible to give, for practical purposes, observations of one species distinct from the other (any more than of the different common kinds of Turnip Flea-beetle), as several kinds appear to feed almost indiscriminately on Peas, Beans, or Clover; sometimes as Weevils on the leafage (as we have long known); and sometimes (as we have learnt in the last two years) in their first stage as maggots at the root.

One great point of prevention would be to keep the autumn Weevils from taking up their quarters in stubble, either for winter shelter down the straws, or for egg-laying by going down in the earth amongst the Clover roots.

Relatively to the first habit, the Rev. J. C. Clutterbuck, who devoted especial attention to this point, mentioned, as noted before:—“ We traced the sometimes total loss of *Trifolium* to this source, as we found the insects in the top joint of the stubble, amongst which we generally drilled the *Trifolium incarnatum* without ploughing. We lightly skimmed the stubble, and so deprived the Weevil of its habitat and refuge; and we believe we abated the evil.”

With regard to treatment that might act in making the ground obnoxious to the Weevil and favourable to the support of the attacked Clover, Peas, or Beans, as by dressings of lime, gas-lime, or other applications or treatment generally, any practical information would be thankfully received.

PINE.

Cottony Pine Aphis. *Schizoneura fuliginosa*, Buckton.

Mr. Angus McIntosh, writing from Llanerch, Llanelly, S. Wales, gives a note of the effect of Paris green (arsenite of copper) in getting rid of *Schizoneura fuliginosa* on infested Pines.

[This Aphis is found on *P. Austriaca* and also on *P. sylvestris*. It may be generally described as black, hairy, and somewhat coated with a mealy secretion when fully developed; with a greyish wool rather than hair in the preceding stage, when it has only wing-cases. It forms white cottony tufts in the axils of the leaves. See ‘British Aphides,’ by G. B. Buckton, F.R.S., vol. iii., p. 96.—ED.]

Mr. McIntosh says:—“ I put two tablespoonfuls of the green into a bucket of water and sprinkled it rather heavily over the Pines with a watering-can. The application soon killed the insect, but it nearly killed some of the Pines! The dose was too strong. A little less than a tablespoonful of ‘green’ to a bucket of water would, I fancy,

be as much as the soft unripe shoots and foliage of the Pines could bear, and would, I have no doubt, kill the insect."

The application of Paris green was found to be so serviceable in checking attack of the Colorado Potato Beetle, when the Potato crop was threatened in North America, that its use has since been worked forward in detail, both as to the method and quantity, &c., by the U.S.A. State Entomologists; and I believe it might be so beneficially used in this country for many kinds of attack on leafage, that I give the following information from the observations on this subject in the 'Annual Report of the State Entomologist for New York,' issued October, 1883.

The precise amount of Paris green which has often been applied without injury to many plants is a tablespoonful (that is, about an ounce and a half) in a pailful of water (that is, about four gallons).

It is more safely applied by syringing than as a dry powder, as, being arsenite of copper, it is of a highly poisonous nature, and without great care the powder, in the dry state in which it may be inhaled, would be excessively prejudicial to the health of the operator.

With regard to method of application, for a few plants it is stated "no other appliances are needed than a small pail and a brush-broom. With the latter in the right hand the water at each dipping may be sufficiently stirred to hold the green in proper suspension, and the liquor shaken over the plants. When a larger amount of the liquid is necessary it may be applied with an ordinary watering-pot, provided with a more finely-perforated rose than that which commonly accompanies it, which can be made by the tinman. The contents of the pot will require constant stirring with a stick to prevent the settlement of the poison."

For application on a still larger scale larger cans are used, which are so arranged that they can be strapped on the back. . . . One of these is described as a "can capable of holding about eight gallons of liquid, and so formed as to rest easily on the back, to which it is fastened knapsack-fashion by adjustable straps. To the lower part of the can are attached two rubber tubes, each furnished with a rose or sprinkler. The tubes are held respectively in the right or left hand of the bearer, and thus the fluid may be rapidly applied to a field crop.* For trees it may be applied by a force-pump (also by a garden-engine) with various adaptations."

The material is purchasable per ton in England under the name of "Scheele's Green." It is procurable at 6d. a pound, with large reduction on taking a quantity.

From the poisonous nature of this compound I would not take

* See 'First Annual Report on the Injurious and other Insects of the State of New York,' by J. A. Lentner, State Entomologist.

upon myself the responsibility of advising its application in a dry powder, which has risk for the operator; or to food crops, although careful analysis appears to show the small quantity of arsenic applied is much below what can do harm in the ground; but stirred into water for such purposes as sprinkling in Pine nurseries, or for application to leafage of infested trees generally, &c., it might be very useful.

Pine Beetle. *Hylurgus Piniperda*, Curtis.



HYLURGUS PINIPERDA.

1 and 2, Pine shoots pierced by Beetles in section; 3, 4, Pine Beetle, nat. size and mag.; ee, jaws, with chin and feelers between, much magnified.

Mr. Robert Coupar, Colenden, Scone, together with observations in confirmation of the notes of habits and methods of prevention of the Pine Beetle, which have been previously given by himself and other observers in these Reports, contributed the following notes on prevention:—

“When young plantations of about six to twelve years old are attacked they may be gone over, say in June or July, and the infested shoots picked off; but (as these Beetles are very wary) at a touch to the branch they back out of their tunnels and fall to the ground. Therefore, after collecting attacked shoots into a basket, the work may prove to have been to no purpose, and on arrival at the end of your journey you may find the shoots quite clear of Beetles, these having all escaped. The most serviceable (and a quite practicable) way is to set a quantity of ‘Beetle-traps,’ which are laid about in the plantation, and are thus arranged:—Cut in the autumn a quantity of young Scots Pine tops (thinning off all the branches, which makes them more convenient to handle). Lay these props about in the young plantations, or up against the lower part of the standing trees, so that the under side *will not rest on the ground*, because the Beetles do not lay their eggs where the trees are lying amongst damp or wet.

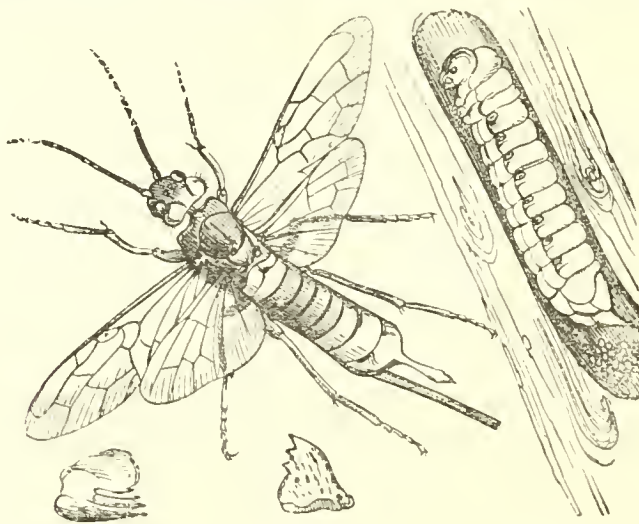
“When the time for egg-laying comes the parent Beetles select these pieces of Pine, and by collecting them again (say in the month of June or sometimes earlier) you will have under the bark a great number of these destructive pests.

“This is a most practicable way, as it answers for plantations of all ages. As I stated before, I have found in old plantations (from 60 to 100 years of age and over) that, when large branches decline and growth becomes languid, then these Beetles select them to lay their eggs in, as also in decaying standing trees. Again, no decaying trees should be allowed to lie, and thinnings should be cleared up as soon as possible.”

Mr. Coupar noted in May, with regard to a large quantity of young Scots Pine, which had been cut down in the course of thinning, that at the time of writing the Pine Beetles were very busy indeed laying their eggs. These Pines had been cut down in the previous January, and the note confirms previous observation of these Beetles choosing, for egg-laying, trees which have been only lately felled, and which consequently have neither the full flow of sap of the living trees nor yet have laid long enough for the inner bark to be exhausted.

Note.—For history and means of prevention of ravages of the Pine Beetle see the observations contributed by foresters given in previous Yearly Reports.

Giant Sirex, “Timber Wasp.” *Sirex gigas*, Linn.



SIREX GIGAS.

Female *Sirex*, and larva.

The splendid insect figured above is not usually credited with doing much mischief in England, but from my own observation I incline to think that this “Timber Wasp,” as it is called in Germany, as well

as a smaller kind, the *Sirex Juvencus*, are more often at work than is supposed.

On September 19th a fine specimen of the female of *S. gigas* was forwarded to me by Mr. Craig from the Bradford Estate Office, near Shifnal, with an enquiry as to whether it was injurious to Larch trees, as it seemed very fond of Larch wood, and had been seen with its ovipositor stuck into the bark of Larch trees, where it was supposed to be placing its eggs.

The female of the *Sirex gigas* is black, banded with yellow, and lays her eggs by means of the strong ovipositor beneath the blunt point to the tail figured in the sketch of the insect in the act of flying. The eggs are thus inserted in solid wood, and, like many other kinds of timber insects, the female appears to prefer sickly trees where there is no rapid flow of sap, or felled trunks to attack.

The maggots are cylindrical and whitish, and the head is furnished with strong jaws, by means of which they gnaw their way forward and form large borings in various kinds of Pine wood, thus wasting much of what would otherwise have been serviceable timber.

These maggots feed for about seven weeks, and *may* then go through their changes to the chrysalis and to the perfect insect in about a month, or the appearance of the insect from the attacked wood may not take place for years.

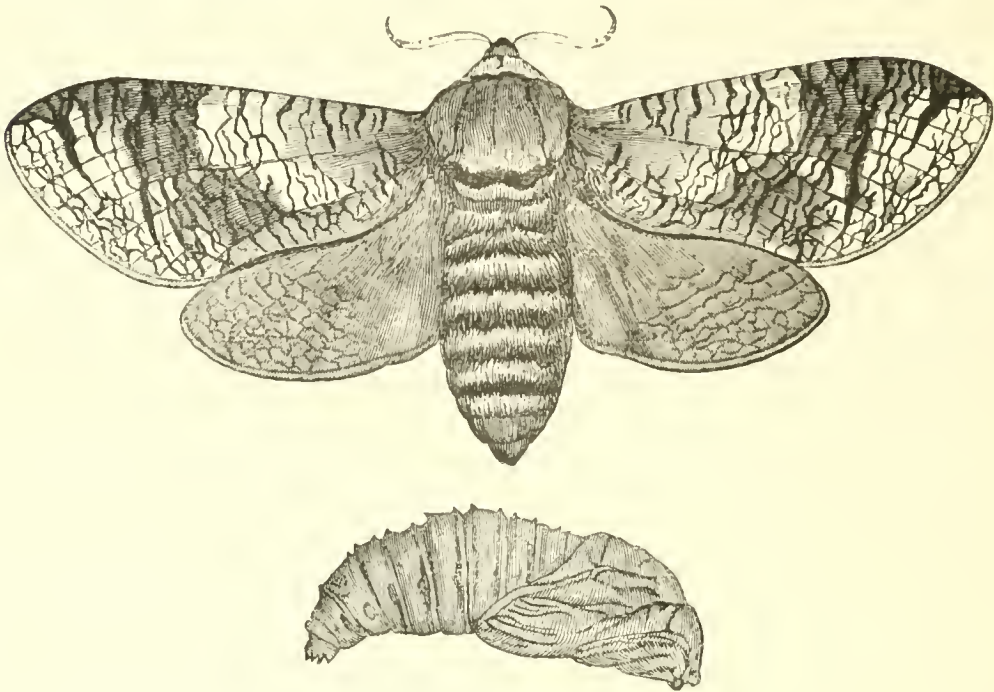
Where these large maggots are found in felled Pine it is desirable to have the trunk sawed up at once, so as to get rid of the centre of attack, as, where there are a few observable, it is very likely there will be many more in that special trunk; but as yet attack of this insect to a seriously injurious amount does not seem to have been noticed in this country.

POPLAR.

Goat Moth. *Cossus ligniperda*, Fab.

On May 15th Mr. Angus McIntosh forwarded me from Llanerch, Llanelly, S. Wales, a piece of Poplar wood containing two caterpillars of the Goat Moth, with the mention that in thinning some Poplars and Willows which grew on a very wet piece of ground it was noticed that several trees which were cut down had been bored into by the grubs. These had made their way into the wood at the lower part of the stems of the trees below the surface of the ground, and had bored upwards. About a dozen of the caterpillars were in the Poplar from which the specimens were taken, and the tree was nearly dead.

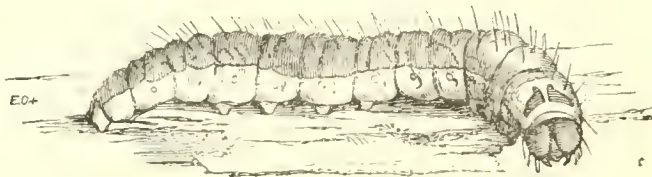
The habit of the Goat Moth is to lay her eggs at the lowest part of the tree, and a badly infested tree may often be known by the wood chips thrown out from the caterpillar workings, which lie on the



COSSUS LIGNIPERDA.
Goat Moth and chrysalis.*

ground close to the trunk, as well as by the moisture where sap is oozing from their gnawed-out tunnels; likewise by the very offensive smell of the caterpillars, which thoroughly impregnates their tunnels and all about them, and from which the Goat Moth takes its name.

The eggs are laid about the middle of the summer in crevices in the bark, and the caterpillars which hatch from them feed at first in the bark or just within it, and gradually, as they grow, penetrate into the solid wood, where they live for three years, and from their great size, likewise the numbers they are sometimes found in, they do great damage, or sometimes entirely kill the tree.



Caterpillar of Goat Moth (not full-grown).

The above figure gives the appearance of the caterpillar when about two-thirds grown. When quite young it is pink, almost

* The caterpillars of this Moth feed in Poplar, Willow, Elm, Oak, Lime, and Beech, as well as in Apple, Pear, Walnut, and other trees.

precisely the colour of a boiled shrimp; when older it is yellow, with patches or a stripe of dark red along the back, and black spots on the ring behind the head.

Many of the caterpillars may be destroyed by looking for the entrance of their burrows near the base of the infested trees, and then driving a strong wire up the tunnel. If the end comes back with white matter on it, it shows that the caterpillar has been reached. I have also seen it answer very well to use a finer wire, with the point turned back so as to form a hook, to draw the caterpillar out with. A surprising number may be taken out this way.

Where the galleries are so twisted that the wire is of no service, the plans (mentioned in previous Reports) are useful of syringing paraffin or tobacco-water up the hole, or blowing in poisonous fumes. The application of a bit of moist clay will prevent either the fluid or smoke escaping.

Plastering round the base of the trunk of any tree which it is wished to protect with some mixture which will prevent the Moths laying their eggs in crevices of the bark also is a good plan.

For this purpose anything that will quite prevent the Moths getting at the bark will serve. A mixture of clay and cow-dung, if put on so as to adhere and form a reliably thick coat, will answer, or clay moistened with a thick solution of soft soap would do better still. Davidson's composition has not been mentioned for the purpose, but this has been found to act so well in sticking fast the Apple-tree Winter Moths (see p. 5) that it would probably fasten any eggs of the Goat Moth which might be laid so securely as to prevent hatching.

This dressing should be done during the latter part of June, and occasionally repeated, as the Moth comes out in June or July. But where a tree is known to be badly infested it is the best policy to fell it, and split up the lower part of the trunk and destroy the caterpillars; otherwise it will both attract more attack and serve as a centre to spread it.

RASPBERRY.

Raspberry Beetle. *Byturus tomentosus*.

On May 28th I received a communication from Mr. H. Wood, of Crockenhill, St. Mary Cray, Kent, regarding a small brown Beetle, which proved to be the "Raspberry Beetle," *Byturus tomentosus*, which was causing fearful havoc and entirely devouring the Raspberries.

Mr. Wood mentions :—" I have noticed this insect in the Raspberries for some years, but never so numerous as they are this season. I have tried several ways to exterminate them, but to no purpose, and the only effectual means I can adopt to remove them is to employ women and boys to pick them off and kill them; this is a very expensive process.

" This season they have appeared rather earlier than usual, piercing the bloom before it has expanded (this shown by specimen sent). They generally enter the bloom after it has expanded, and then eat completely through it.

" This insect is a fearful pest; the fruit-growers in this neighbourhood complain most fearfully of it."

The *Byturus* is a small Beetle, somewhat less than a quarter of an inch long, generally of a yellowish brown or reddish colour, and covered with a grey or yellowish down. The grub is of a yellowish colour, browner along the back, and with a light brown head. This grub is to be found in June and July in Raspberries and in Blackberries, on which it also feeds. When full-fed it leaves the ripe berries and shelters itself in cracks in stems, or some similar place, where it changes in a kind of cocoon to a chrysalis, from which the Raspberry Beetle comes out in the following spring, and the females presently lay their eggs in the quite young Raspberries.*

The only means of preventing ravage that has been advised appears to be shaking down the Beetles early in the morning (or on dull days when they would not be disposed to fly) into anything convenient, and destroying them. Probably shaking on to tarred boards, in the way which has been found very successful in getting rid of the Raspberry Weevil by growers in Cornwall, would answer well. But further, as the chrysalis winters in shelters amongst old stocks, it could not fail to be useful to clear out all remains of previous year's canes, and also, where there has been bad attack, for some person *interested in the matter* to see whether he could not find the little chrysalis-cases in the rifts of the cut-down stems, and, if so, adopt measures to get rid of them by thick soft-soap dressings poured in, or such other measures as might be preferred.

Raspberry-bud Caterpillar. *Lampronia rubiella*, Bjerk.

The caterpillar of the above very small Moth, unless well looked after, has been found at times to do great harm to the Raspberry crop by feeding within the stem-buds or the tips of the growing shoots. I am indebted to Mr. W. Jenner Weir for the following description of

* 'Prak. Insecten kunde,' by E. L. Taschenberg, Part II., p. 16.

method of attack, and also for the identification of the caterpillar as that of the *L. rubiella*.*

On May 2nd Mr. Weir wrote me that a row of Raspberries in his garden at Chirbury, Beckenham, was seriously attacked by these small red larvæ. They were found in the tips of the fresh shoots, which they entered at the growing point when the shoots were about an inch long, and ate their way down towards the cane, thus causing the shoot to wither, and on examination the shoot was found to be quite hollowed out.

The small caterpillars were then only about the eighth of an inch long, of a bright red colour, with a brown head, and a brown spot on the segment next the head. The caterpillars were sometimes seen outside the shoots, but they were in no case found to *leave* the bud which had been attacked, so that, as far as could be seen, each caterpillar only destroyed one shoot. Where there were two buds from one eye it was rarely found that more than one was attacked.

The remedy applied was to cut off the infested shoot, and to destroy it with the insect within. In the hundred canes or thereabouts operated on about half the buds were found to be infested. The dis-budding, of course, strengthened the growth of the buds that remained, which grew luxuriantly, and bore a very large crop.

The life-history of this Moth is given in detail by Prof. Westwood in a paper of the 'Gardeners' Chronicle,' to which reference is given below, from which I extract the following information:—

The caterpillar turns to chrysalis in a slight web amongst the shrivelled leaves from about the middle of May to the beginning of June. The Moth, which comes out from this chrysalis in about a fortnight or three weeks, is very small, scarcely half an inch across in the spread of the wings. It has brown wings, the upper pair spotted with gold-colour, of which spots two of the larger ones meet when the wings are folded along the back. [Somewhat like the pattern of the "Diamond-back Turnip Moth," see fig.—ED.] The female Moth lays her eggs in the Raspberry stem, the young caterpillars hatch at the beginning of August and feed on the Raspberry foliage, and *secrete themselves during the winter*.—See Gard. Chron. for 1853, p. 757.

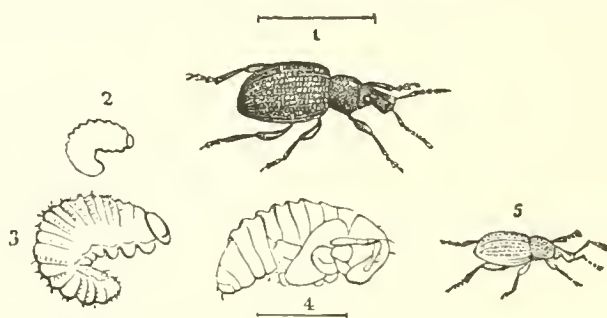
With regard to measures of winter prevention, it is plain that, as the caterpillar takes up its winter-quarters either in such shelter as it

* The many appellations that have been bestowed upon it, of which the list is given by Prof. Westwood in his excellent paper on this insect (Gard. Chron. 1853, p. 757), are of some interest, as showing the great difficulties which variety in scientific name causes to enquirers. The Moth was the *Tinea corticella* of Linnæus; the Swedish naturalist, Bjerkander, named it *Tinea rubiella*; it was placed by Stephens in the genus *Lampronia*; Fabricius named it *Alucita variella*; Duponchel gave the specific name of *multipunctella*; Sodoffsky that of *Fischerella*; and it is stated to be the *Glyphipteryx variella* of Stainton's 'Catalogue of Tineidæ.'—ED.

can find on the stems or amongst the earth at the root of the plant, that these are the points to be met. Clearing away all wood that is not wanted, as thoroughly as it can be done, including in this the removal of all old stumps of former canes, would get rid of a deal of *shelter*, and thoroughly stirring and throwing aside the earth which is just at the base of the canes would get rid of whatever was *sheltering*. There would be no need to carry it away, for the simple exposure to wet, together with cold on the surface, would soon kill these small caterpillars.

This attack may be taken as an example of many kinds in which it is only necessary to mention the habits of the "pest" for each grower to be at once able to tell for himself how to get rid of it far better than by advice from others.

Brown-legged Weevil. *Otiorhynchus picipes*, Fab. (and other species).



OTIORHYNCHUS SULCATUS, &c.

1—4, *O. sulcatus*, larva, and pupa, magnified, with lines showing nat. length;
5, *O. picipes*.

The following note, sent me on May 24th, with specimens accompanying, by Mr. G. Bradley, Ivy Hatch, Sevenoaks, gives some idea of the enormous amount of injury caused by this Weevil (the *O. picipes*, sometimes known as the Clay-coloured Weevil), as well as by other kinds of *Otiorhynchus* :—

“Please find enclosed some Beetles, also a twig of Red Currant, Cob Nut, Damson, and Raspberry. You will see the damage they do in fruit plantations by biting the bark of the hard wood, and the way they eat the young Raspberry twigs. This season they are very numerous, and have made sad havoc in some fruit plantations in this neighbourhood.

“We never find them on *very* sandy soil, only on loamy soils; they hide up in the day underneath the small clods close to the stems of the various trees they feed on.

“I have tried quick-lime, soot, and paraffin diluted with water: whatever you do appears no good, excepting catching and killing them.

I have caught 105 Beetles round the stem of a Cob-nut tree. My neighbour planted 150 Briar-stocks for budding Roses on ; they have eaten every bud out of the stocks."

On June 6th Prof. Allen Harker, of the Royal Agricultural College, Cirencester, forwarded specimens of another species (*O. tenebricosus*), which were then doing much harm by eating leaves of the Strawberries in the garden of the College Farm. This kind is about the size of the magnified figure of *O. picipes* given, but differs in being more pointed at the tail, and also in being of a bright shiny black colour.

The Weevils were in such numbers that thirty of them were secured in a few minutes from their daytime shelter around the Strawberry roots. A female that was dissected contained eggs fully developed.

The habit of the Weevils mentioned in both the above communications of sheltering away from the light during the day is one great means of keeping them in check. With regard to the Strawberry plants, a temporary shelter, such as pieces of boards or tiles, was laid along by the plants, and, on raising these, the Weevils were found collected in such numbers beneath, that nothing further was needed to clear them out, excepting sending a boy round regularly to gather them up and destroy them.

In the larger scale of plantation fruit-growing it would be some slight expense to have them thus collected, but still this would be nothing to the loss from damage to the plants. It would soon be found what kind of shelter they preferred, and by placing some of this, whether slates, tiles, odd bits of thin turf, or *morsels of old waste sacking*, on the ground by the stems of the young trees, these would probably form excellent traps, which might be cleared daily with little trouble.

Where the infested plants are large enough to admit of the Weevil being shaken off (when they have gone up again to feed at night) on to *tarred boards*, or anything placed below to catch them, this plan answers thoroughly well. (See account of method of clearing *O. picipes* in Raspberry grounds in Cornwall, 'Report of Injurious Insects,' 1879). Something might also be done by putting some sticky mixture round the base of the trunks of the young trees (see p. 5 of present Report). Anything would serve the purpose that would not hurt the bark enough to damage the health of the tree, and which, either by stickiness or by being obnoxious to the Weevil, would catch it fast, or prevent it walking over the band of smeared-on preventive.

Tar and cart-grease mixed might do very well, for it would keep damp for some time, or "Davidson's Composition" would perhaps answer as well for this purpose, as for catching the wingless Winter Moths as they creep up the tree stems, as before mentioned,

Otiorhynchi lay their eggs in the ground, and their maggots feed on roots and turn to chrysalids in the ground. Where it is possible to apply a good quantity of gas-lime I have found it answer to clear out the maggots, as well as it could be managed, and put gas-lime as a coating. In the case of young trees a layer might, I believe, be safely put, say for a fortnight, on ground supposed to be infested, and of which the uppermost four to six inches had been turned to the top. All the maggots and chrysalids thus buried in the gas-lime would be killed, and the material could be removed if too thickly laid on to remain safely. Lime or quick-lime does little good in cases like this compared to the caustic gas-lime, which kills the soft maggots if it touches them, or poisons them by the dissolved fluid running on the first rain, from it into the infested ground.

STRAWBERRY.

Strawberry-leaf Button-Moth. *Peronea ? comariana*, Zell. ;
P. ? comparana, Hüb.



PERONEA (? COMARIANA).*

Moth, and caterpillar hanging from leaf by thread. (Fig. drawn by Dr. Ellis.)

* The *Peroneas* form a genus of exceedingly small moths somewhat uncertain in distinguishing points. The above specimen having been variously named by two skilled authorities, I give both names to save possibility of error as to species.

The following observations on the attack of a Moth-caterpillar often severely injurious to Strawberry leafage was communicated by Dr. Ellis, of Liverpool, from Mr. Richard A. Wrench, Dee Banks, Chester:—

“I enclose specimens of a grub which infests the Strawberries about here (Dee Banks, Chester), and does a great deal of harm; the bulk of the Strawberries for Liverpool Market are from here. I may say it usually makes its appearance about the beginning of May, and lasts until about the end of August, when it goes away.

“Young Strawberry plants of twelve months old are never affected; two-year-old plants are affected rather badly, but three-year-old plants are invariably ruined.

“I have two fields adjoining one another, the old field utterly ruined by the grub, the next, only separated by a hedge, perfectly clear; but next year, when it will be two years old, it is sure to be full of blight.”

Here we have only the above notes and Dr. Ellis's sketch* to guide to means of prevention, but I think these are enough to help us.

It will be noticed the caterpillar is hanging by a thread, and, as it has the *means of lowering* itself to the ground, it is very likely that though many may turn to chrysalids in the spun-up leaves, yet that many may go down their thread to the earth, and the winter brood there turn to chrysalids, and that it is from these chrysalids that the Moths come out in the following spring, at the season to start a new attack on the new leafage in May, as mentioned by Mr. Wrench.

Mr. Wrench notices the absence of attack in the first year, moderate attack in the second, and devastation in the third, which also seems to me to point to the chief numbers of attackers coming up out of the ground, for, if these little Moths *flew* to the plants in any great numbers *from elsewhere*, the attack might be expected to be much the same in amount on beds one or two years old.

If this is the case, the treatment of skimming off the surface-soil with the chrysalids in it, and getting rid of it in such a way that the

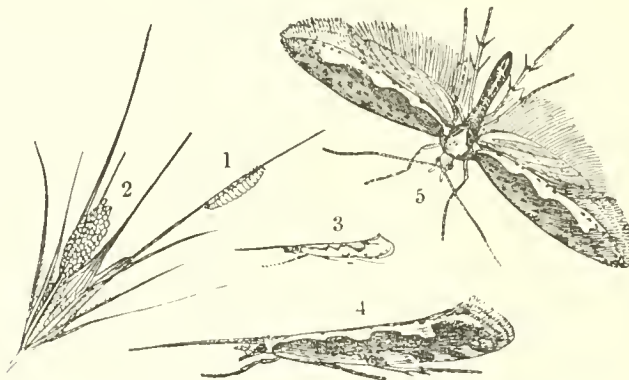
* The following description of the Moth, *Peronea* (? *comariana*), in its three stages, is communicated by Dr. Ellis:— “*Larva*: Cylindrical, shining, slightly bristly; head glassy, pale yellow, with brown spots on each side behind; general colour green, darker above, lighter below, with the dorsal vessel well marked and darker. Feeds in May and early part of June on Strawberry, drawing together the leaves and flowers for this purpose, in the latter case feeding on the calyx and receptacle. *Pupa*: Pale green, with reddish wing-cases and abdominal segments. *Imago*: Emerges end of June. Fore wings very pale ochreous, slightly darker on the hinder half; near the middle of the costa is a dark brown, nearly black, triangular blotch, reaching two-thirds across the wing, and continued to the inner margin as a slight brownish cloud. A dark patch on the inner margin indicates the edge of the basal patch. Hind wings grey.”

Moths should not hatch out to renew attack, would answer as well in this case as it is known to do practically in getting rid of Gooseberry caterpillars. If the soil is only stirred and manured, and the plants roughly trimmed, this does very little to clear out chrysalids; but in skimming off the soil with the withered leaves, which have been webbed-up in summer, the chrysalids would be carried off also, and from one place or other (either on the soil or in it) one might entirely hope to get rid of the chrysalids that would start the next year's attack.

Further details of the life-history of this Moth would be acceptable, as great injury is done elsewhere by Moth-caterpillars to Strawberry grounds, and very little (beyond this damage) is known of their habits.

TURNIP.

Diamond-back Moth. *Plutella cruciferarum*, Zell.; *Cerostoma xylostella*, Curtis.



CEROSTOMA XYLOSTELLA.

1, caterpillar; 2, eggs; 3—5, Diamond-back Moth, nat. size and mag.

The appearance of the Diamond-back Moth caterpillar on the Turnip crops is of a good deal of interest, as this attack has only been recorded (with us) now and then, and when it does happen it is often very destructive. It is open to doubt, however, whether it is not more common than has been supposed, and that the attacks may have been passed over as those of the "Nigger" or Turnip Sawfly caterpillar.

The Diamond-back Moth is of the size figured above at 3, with a pale stripe and spots along the hinder edge of the fore wings, which give the appearance of a row of diamond-shaped markings running along, as shown (magnified) at 4 and 5. These Moths fly in the

evening, and lay their eggs (sometimes in great numbers) on various kinds of plants, and especially infest all the Cabbage tribe.

The caterpillars are about half an inch long, and slightly tapering to the head and tail, green or yellowish in colour, with grey or black head, and the ring next the head has several small black spots. These, when full-fed, spin cocoons of fine net-like texture on the remains of their food-plants, or on the ground, from which the Moth comes out in about three weeks or less, so that there may be a succession of generations during the summer. The autumn chrysalids remain unchanged during the winter. The caterpillars feed in heads of Cauliflower, and on unripe seeds of some plants of the Cabbage kind, as well as on leafage.

The first specimens of these Moths were sent me on July 9th by Mr. Edward Riley, from Kipling Cote, Market Weighton, who mentioned, on August 27th :—"When we began to hoe the Turnips on July 9th I was struck with the number of Moths flying about (hundreds of them), and was certain mischief would follow. However, the caterpillars did not do much harm to the early White Turnips, but some Rape in the same field was damaged seriously. The Rape leaves had white patches as large as a shilling all over the leaves, and, in the case of a neighbour's Rape adjoining, the leaves were quite blanched." [This white appearance was probably from the exceedingly fine web, like the thinnest gauze, which the Diamond-back caterpillars have been noticed as spinning over parts of the leaf whilst feeding (see Curtis's 'Farm Insects,' p. 87).—ED.]

Mr. Riley further says :—"I had a field of Swede Turnips attacked, and at once sowed nitrate of soda at the rate of 1 to 1½ cwt. per acre, putting a small quantity on each Turnip, which in ten days had a marvellous effect, the Turnips growing right away from the attack.

"I think the reason the caterpillars have done so little damage among the early White Turnips is that they grew so wonderfully well from the first."

On July 30th I received information from Mr. H. Stourton, of Holme Hall, York, that a great deal of damage was being done to Turnips by a caterpillar (of which specimens were enclosed) feeding on the leaves. These caterpillars proved to be of the Diamond-back, and nitrate of soda was about to be used to "put some strength into the plant."

On August 8th Mr. Stourton mentioned that he hoped not to suffer to any great extent, but that there were bad accounts from some farms in the district up to a week before ; the Turnip plant had been looking very weak from the wet cold weather, but was then looking more healthy. He notes :—"I put on nitrate of soda and soot where the caterpillars were numerous ; we shall see the result. One of my

workmen said that he remembered these pests in other years, and he had known farmers tie Willow branches on the scufflers to sweep the leaves. At this date some of the caterpillars were turning to chrysalids, and on the 21st of the month the Moths were appearing. At this date (from favourable weather for growth) some of the damage was being repaired, but it is noted that "here and there patches were entirely destroyed in spite of the nitrate of soda." It is also noted, "I think sweeping the leaves with Willow branches has done some good."

The information in the above short notes which Mr. Stourton favoured me with is very useful, as showing the amount or the effect of attack may be much lessened by a hearty growth of the plant, whether from favourable weather or from the use of fertilisers which would act at once, such as nitrate of soda. Also that the mechanical measure of brushing with boughs, which is useful for getting rid of the "Niggers," is available here.

The Diamond-back caterpillars let themselves down by a thread when alarmed; consequently, by the passage of the scuffler after the boughs, many must get destroyed on the ground.

About the beginning of August I received the two following notes through the 'Mark Lane Express,' which, by the courtesy of the Editor, I am permitted to use, describing outbreaks of what appeared to be the same kind of attack near Harwich, and also near King's Lynn:—

Mr. Stanford mentions from Great Oakley, Harwich:—"I enclose Kohl Rabi and Swede plants, which you will perceive are very much eaten by a small green caterpillar, some scores of the insects being on the plants in the box. The fields of Turnips in this district are almost destroyed, several pieces having been ploughed up in consequence of the damage done by this insect. Can you kindly inform me what the name of the caterpillar is, as I never remember seeing it until this year? I myself have sixteen acres of Swedes eaten like the plant enclosed."

The note given by Mr. F. J. Cooke on August 10th from Hitcham Abbey, King's Lynn, likewise mentions the serious nature of the attack, and it being of a kind not generally known. He says:—"I send you by this post some Swede-Turnip leaves, which you will find are perforated by a little caterpillar, two or three of which you will find still on the leaves. Two others have spun themselves a cocoon, in which they are awaiting the next stage of their existence. These pests are, of course, quite distinct from the brown grub or caterpillar that attacks the Turnip root, but they promise to ruin much of the later Turnip crops in this district, and are new to me and all of my neighbours to whom I have spoken. They and I will be interested if

you can help us to some knowledge of the life-history of this new enemy, which promises to be as destructive as the fly which attacks the leaves of Beet."

With regard to remedies, the treatment for Turnip Sawfly attack (see previous Reports) appears best, that is, all measures to *secure good growth*; likewise brushing of the caterpillars with boughs in whatever way may be most convenient; and also *not* hoeing or singling when bad attack *is present*. Probably diminishing the wild plants which attract the Moth would also make a difference.

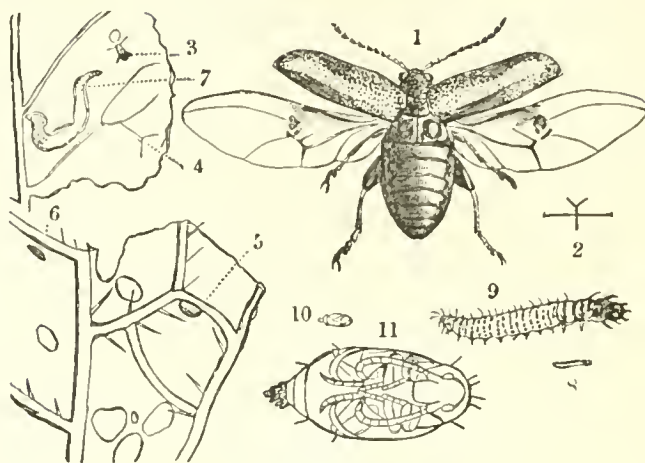
I am favoured by a note from Lord Walsingham of *Plutella cruciferarum* having been remarkably abundant this year, and of his having found the caterpillars feeding in great numbers on *Sisymbrium Sophia* (the fine-leaved Hedge Mustard or Flixweed).

This caterpillar also feeds on other plants of the Cabbage tribe, as "Jack-by-the-Hedge," which grows on hedge-banks, "Wall Mustard," and others. It also frequents the *Salsola Kali*, or Saltwort, a plant very nearly allied to the very common Goosefoot and Orache of the fields, but which grows by the sea-shore, and may have to do with the attack of the Diamond-back being often noticed near the coast.

Note.—The following very good observation of attack in Caithness, which I consider very likely to have been caused by the Diamond-backs, was sent me by Mr. George Brown, of Watten Mains, Caithness, but to my regret I was unable, at the time of receipt, to identify the caterpillars with certainty; therefore, as the account of such widespread damage is of considerable value, both in itself and for future reference, I give the report as a note:—

"But the most persistent pest of the season on our Turnip crop is that of the insect of which a specimen caterpillar was sent you some time ago. Its ravages on the leafage have been very great, so much so that on many fields, especially along the sea-board, fears are entertained that the plant cannot bulb. Driving round the coast the other day [date of letter, Oct. 3rd.—ED.] we were much struck by the appearance of the leaves; they looked as if the crop had been thickly powdered with quick-lime. On close inspection the green parts of the leaves were found to have been completely eaten away, and the remaining membrane was so punctured in every part that it forcibly reminded one of white net, or still thinner web. Their manner of feeding is somewhat different from Sawfly caterpillars; they descend the leaf-stalk and conceal themselves during the day in the heart of the top where it joins the bulb, and come out at night to feed all over the leaves."

Turnip Fly. *Haltica (Phyllotreta) nemorum*, Curtis.



HALTICA NEMORUM.

Turnip Flea Beetle, eggs, maggot, and pupa ; nat. size and mag.

The subject of Turnip Fly was so fully reported on in 1881* that it appears as if little could be added for general use to the practical methods of treatment then noticed. The two or three following observations may, however, be of use in drawing attention again to some of the more important points of treatment, as the application of dressings *when the dew is on*, and the Flea Beetle consequently cannot use its leaping powers to get out of harm's way ; the use of mixing Mustard with Turnip seed to draw the Flea Beetle away from the Turnip when the young plant comes up ; the importance of all agricultural measures to give such a healthy growth as will run the young plant quickly on past the stage for attack ; and likewise the benefit from watering, *where this can be managed*, and the application *continued* during time of drought.

Mr. D. Byrd, writing from Spurstow Hall, Tarporley, mentions "the Turnip Fly has been less troublesome this year. I believe that I have saved the crop many times by dusting a little soot and lime on the Turnip leaf *in the early morning while the dew is on*, leaving the Charlock and other weeds untouched between the ridges for the Fly to feed upon until the Turnip got its rough leaf ;"

Mr. Edward Lingwood, writing from Thwaite Stonham, Suffolk, mentions :—"It is at least twenty years since I had any occasion to resow Swedish Turnips, my plan being, after getting the land as level and in as good tilth as possible, to plough it into ridges 27 in. apart about the end of May. Between these I spread twelve cart-loads an acre of farmyard manure that had been previously fermented in a heap, on this dressing sowing broadcast 3 cwt. of superphosphate, the ploughs following as quickly as possible. As soon as the ridges

* See 'Report on Injurious Insects for 1881,' pp. 47—97.

are dry enough a light rolling is given. The next proceeding is to mix equal parts of Swedish Turnip and common Mustard seed together; a single row of this is then drilled on each ridge at the rate of three pints an acre, a light roll following to put out the drill-marks. This is important, as I long ago discovered that, while the insect took off the plants that stood in the hollows, those on the hills escaped with a mauling; this of course was when the seed was sown broadcast. Mustard seed is not only 50 per cent. cheaper than Swedish Turnip seed, but the plants are more easily singled where it is made use of.

“For White Turnips I make 24-inch ridges, sow a liberal quantity of superphosphate and plough it in, as I drill these late to stand the winter. I seldom have much trouble with the insect; if so, I use the light roller.

“This spring I drilled some Enfield Market Cabbage the beginning of April, and, thinking it too early for the enemy, mixed some dead Turnip seed instead of Mustard with the Cabbage; this proved an unfortunate mistake, for just as the plants appeared we had a hot day or two, and the consequence was I found from three to five ‘flies’ on every plant; but some slacked lime *sown early* the next morning saved the crop, whilst a neighbour lost his entirely.”

Mr. James Whitton, Coltness Gardens, Wishaw, N.B., notes:—“I have found the use of water of great use in checking ‘fly.’ On its first appearance I dust the bed or seed-lines with lime *early in the morning*, and, if the weather is at all dry, we water the Turnips regularly *at night* until the plants are all safe. This I have practised for many years.”

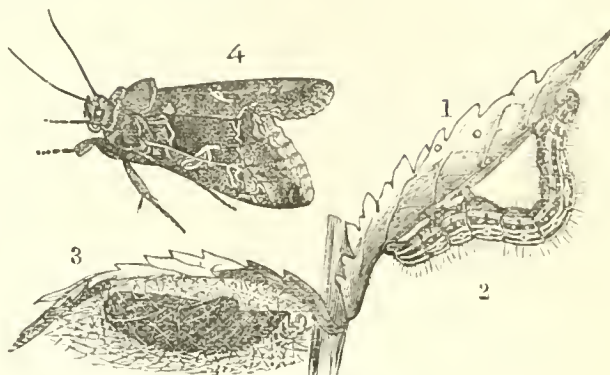
Turnip Fly is mentioned by Mr. Robert Coupar, of Colenden, Scone, as having been very injurious to the crops in that neighbourhood in 1883, many farmers having been obliged to sow two and three times.

Silver-Y Moth. *Plusia Gamma*, Linn.

On October 3rd Mr. George Brown forwarded me from Watten Mains, Caithness, N.B., a specimen of a Moth developed from a green caterpillar, of which the attack had been doing much harm to the Turnips by eating away any green part of the leaves which had escaped the attacks of the other kinds mentioned at p. 75.

With these were forwarded moth-chrysalids in web cocoons, with the note:—“Corn crops are perfectly covered with these cocoons; between the sheath-leaf and stalk in the Corn, in the seed-stalks of Sorrel, and on every and all parts of the Field Thistle, the cocoons appear.”

Later on, on October 16th, more specimens were sent, which showed the Moth to be *Plusia Gamma*, or Silver-Y Moth, sometimes



PLUSIA GAMMA.

Silver-Y Moth, caterpillar, and chrysalis in cocoon.

known as Beet Moth, which is figured above, together with its "half-looper" caterpillar and the light web cocoon in which it changes to chrysalis.

This Moth does not appear to trouble us much here, but on the Continent it occurs from time to time in vast numbers, and the caterpillars are most general feeders.

Amongst cultivated plants which they attack are leguminous plants, such as Peas, Broad Beans and Kidney Beans, and likewise Clover. Turnip leaves and various plants of the Cabbage kind, and likewise Lettuce, and Beet also, are sometimes severely injured. Corn crops have escaped a while when bad attack was going on, but after a time the Oats were found to be suffering.

Amongst the common weed plants which serve as food, John Curtis mentions Thistles, Burdock, Nettle, and others, and also grasses.

From continental observations it appears that some of the caterpillars hibernate; these are only about half-grown when winter comes, and reappear to go on feeding and complete their growth in the following year; but I have not found any note of this taking place with us, and I have had specimens as chrysalids in cocoons developing into Moths in the middle of October. This is an important point to know more about, as, in case of *P. Gamma* only passing the winter with us, either as stray specimens of the Moths or as chrysalids above ground, exposed to changes of weather, it would at once account for the attacks being much less severe than where there is a late brood of caterpillars safely stored during winter in their own chosen shelters to come out again in spring.

Where the attack is found on Turnips any measures calculated to brush them from the leaves, such as those advised (p. 75) for Sawfly caterpillars, would be desirable. In gardens hand-picking is best, so as to make a thorough clearance at once.

SLUGS.

Field Slug. *Limax agrestis*, Linn.

Black Slug. *Arion hortensis*, Ferussac.

These common pests have been reported as very injurious at various places in the past season, and, as the treatment in the following case proved successful in clearing a bad attack, I am kindly permitted to give the following communication :—

On July 31st I was favoured with a note from Lord Portman relatively to Slugs, which were causing much harm to his Turnip crops at Bryanston, Blandford. The specimens forwarded were mainly of the Field Slug (*Limax agrestis*),* together with a very few of the *Arion hortensis*, sometimes known as the Black Slug.

The attack, which was to Turnips on land broken up after Clover, which had been mown in two successive years, was very severe. The Turnips had been resown twice, and on each occasion the plant had been destroyed by being eaten just above the root and below the leaf. Salt had no effect, and lime also failed. Looking at the point that the Slug has a power to moult off a coat of lime a *few times* successively, and thus get rid of an obnoxious dressing, but that after this operation has been repeated two or three, or at least a few, times that the creature requires an interval to regain this power, it was suggested to repeat the dressings several times, *as near together as could be*, and the result, as shown by the note given by permission of Lord Portman, was a thorough clearance.

It is mentioned:—"We ploughed a furrow round the attacked plot, and filled it with quick-lime to cut off pest invaders. We fed the adjoining land very close with sheep and cured any Slugs therein. We then dressed the Turnip land with a mixture of soot and lime in one part and salt in the other. The first day did but little good; the second doses were effectual, and, being repeated at dawn and dusk, killed the enemy.

"The soot and lime acted best.

"We have now a good crop of Rape, which was sown when the

* The *Limax agrestis* is exceedingly common, and may be distinguished in a general way by its moderate size, its light ash or cream colour, which has been stated to get darker and mottled with brown flakes later in the season, and also by the shield on the back having slight concentric lines on it, which are more faint and distant than in the other species. It is stated to produce several families, averaging fifty each, during the season. The *Arion hortensis* is also very common, and is about the same size as the "Field Slug," but may be known from it by the shield having a rough surface, as if shagreened. The colour is wonderfully variable, being "brown, red, yellow, grey, greenish, or black," usually somewhat striped along the back and sides, and covered with coarse oblong tubercles. (See Jeffrey's 'British Conchology,' vol. 1).—ED.

Turnips were devoured, and of Turnips in the parts which were saved by repeated dressings."

On Sept. 13th Mr. Jabez Turner, of Norman Cross, Peterborough, mentioned that a field sown with *Trifolium incarnatum* on August 30th was being much injured by some pest, and on Sept. 21st he forwarded specimens of Slugs which, with many others of the same kind, he had found that evening amongst the *Trifolium*, "the plants of which have now nearly disappeared." Mr. Turner further notes that the *Trifolium* was sown on Oat-stubble after Mangolds and Potatoes, and that the Slugs were smaller than the kind which usually does so much damage to Clover Ley Wheat.

This Slug was the *Limax agrestis*, sometimes known as the Field Slug or Milky Slug, from its abundant viscous or milky slime.

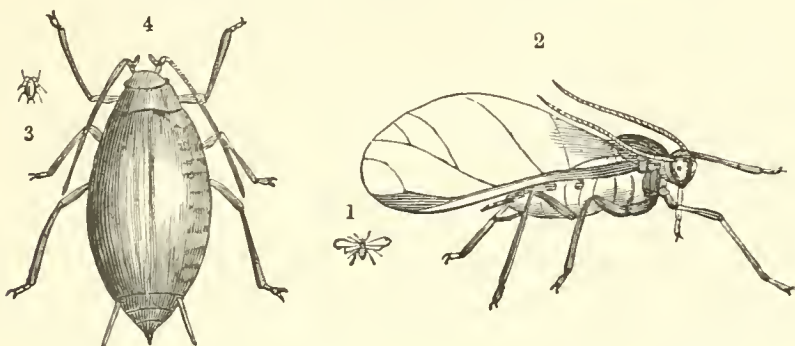
A great deal of loss both in garden and field would be saved by considering the above power of the Slug.

Where a heavy dressing can be put on, as we may do on unoccupied land, so that wherever the Slug crawls there is the obnoxious stuff, it would soon exhaust its slime-producing power and perish; but where there is a growing crop this can seldom be managed. Lime slakes rapidly in the dew of the morning or evening when the Slugs are out, which is the time for dressing, and if, as is frequently the case, it is thrown at a *few days interval*, it is too often waste labour. I have seen the Slug resting as comfortably in the slaked lime as if under a stone; but, on the contrary, where the dressing is given as above *at short intervals*, there would be every reason to hope the pest would be got rid of.

APPENDIX.

OBSERVATIONS ON FIRST APPEARANCE, &c., OF HOP APHIS.*

Hop Aphis. *Aphis (Phorodon) Humuli.*



1 and 2, Winged Female Aphis ; 3 and 4, larvæ or lice ; nat. size and mag.

THE following observations regarding Hop Aphis were sent to me during the past season in answer to my circular of March 8th of the present year, requesting information from those conversant with the subject as to *first appearance of Hop Fly or Louse*.

I much regret that they are so few in number compared to what could be wished for on such an important subject, that consequently the method of Hop Aphis attack, that is, the place *from* which—or the form *in* which—it comes, cannot yet be considered as proved ; but I submit the notes to the contributors who have kindly sent them in the hope that they will turn over the matter in their minds, and work the subject forward further in the coming season.

As points connected with Hop-growing can only be judged of properly by those who have a practical knowledge of the subject, I give the notes, as nearly as possible, in the senders' words, merely removing observations which did not especially bear on the subject in hand, and also dividing the information given under different heads.

It will be seen, firstly, that with *few exceptions* the contributors agree in the point of the Hop Aphis being *first observed as Fly*,—that is, in the winged form,—and *also* that it has been first observed by

* This paper, in a separate form, was distributed earlier to contributors of the information, and some others, for observation during the present winter.—E. A. O.

them towards the *top of the plant*; secondly, observations are given of the Hop Aphis *occurring on Plum and Sloe*.

Observations are likewise given as to Hop Aphides and their eggs *not having been as yet found* in winter shelters, also on Hop Aphis *having been found* on Nettle.

An important observation is given of Hop Aphis appearing on a plant which had been enclosed carefully from outside attack.

There are also notes on benefit from *healthy growth*; from *washings*; and from presence of Ladybirds.

Still, however, it appears to me that the *only* method by which we can make absolutely sure whether Lice come up from the ground or not is by isolating Hop plants. This is the way in which the history of the Vine *Phylloxera* was completed, and, though there would be difficulty in elaborate arrangements, there would be little trouble in the method noted at p. 10, of fastening three poles together at the top, and enclosing the plant within with stout muslin, so early in the year and so securely that there could be no entrance from outside. So we should *know* what was happening.

At present *nothing is proved*, but there is no doubt that Aphis attack is considered by most of the contributors of the following notes to appear first as "Fly."

With regard to what plants these "Flies," *i. e.*, winged Aphides, come from, it may be from *Plum or Sloe*, or apparently it may be from *Nettle*. I have had opportunity of making sure, through the assistance of Mr. G. B. Buckton, F.R.S., that specimens of Aphis on Plum leaves were the same kind as the Hop Aphis; and also specimens of Aphis were sent me on Nettle leaves, which I could not find differed in any way from Hop Aphis.*

OBSERVATIONS OF THE FIRST APPEARANCE OF HOP APHIS AS "FLY," AND ON THE UPPER PART OF THE PLANTS.

The following communications give observations of the Hop Aphis being first observed as Fly, *i. e.*, winged; also of attack beginning on the outside of the gardens, when the wind is from a cold quarter; and that ground exposed to cold winds, or cold and damp, are found to suffer.

Dr. Chapman's note regarding larger wingless Aphides being observed by him in 1882 amongst a large number of small ones, is

* The reader will please observe that, though the common English names are used for convenience, I am not confusing the various sorts of Aphides. By the Hop Aphis throughout I mean the *Aphis (Phorodon) Humuli* or the *Aphis (Phorodon) Mahaleb* (which *may* be a variety, but if not, is the same as the *A. Humuli*); and it is this *A. Humuli* or *A. Mahaleb* which I allude to as having occurred on Plum and Nettle. I am not referring at all to *Aphis Pruni*, nor to *Aphis Urticaria*, nor to *Aphis (Siphonophora) Urticæ*, or any other Aphis of the Plum or Nettle, only to the Hop Aphis.

very valuable, as it points to the likelihood of the *wingless females* having wintered in the earth and starting attack, as well as the winged females. In some cases the observations were sent me every few days, and I give these short notes with the dates, as it shows the careful watch kept. The first note is as follows :—

“I have about thirty acres of hops. The Fly has always been observed first. I do not think I have ever seen it until the Hops were from three to six feet high. It is always seen first on the latest or youngest leaves, *i. e.*, within an inch or two of the head of the shoot, and before the leaf is developed.

“With a slight attack of Fly there are about three or four Flies on the top leaves of nearly every Hop; in a bad blight the leaves are nearly black with them.

“The Fly always, or nearly always, appears when the wind is in the east.

“I have some Hops growing in a low situation, nearly on a level with the river, and they always suffer most from the blight.”—H. H. DEANE, Elbridge House, near Canterbury.

“I have for upwards of fifty years been a close observer of the Hop plantations in this district, and still continue to be so.

“The first Aphides which appear are the winged ones; they are found on the tender leaves of the plant, on the outsides of the gardens, generally on the E. or S.E. sides. There appears to be a certain locality in every plantation where the first are to be found; and the same (or very similar blight) *is to be found on the common Nettle* (see p. 9), and, as long as it remains on the Nettle, it is sure to be found on the Hop.

“If the outsides of the garden can be kept free from blight, the middle takes no harm. I have never found Lice making their way up from the ground, but invariably first found them on the young leaves on the top of the plant where the winged Aphides exist, or have done.”—J. W. HOPKINS, Lower Wick, Worcester.

“The Hop Fly generally appears in the middle of May or early in June outside the grounds, and the coldest situations are attacked first, where the cold winds have most power and the flow of sap of the plant is most checked. I have known some seasons entirely without them, in a fine healthy time propitious for the plant.

“Sometimes we find that yearling and two-year-old grounds are free from the pest, and grow kind Hops when all others fail. This I attribute to the healthy young plant.”—RICHARD HEMING, Cheltenham.

“During my experience I could never make out where the Hop Fly come from. I only know that they come in the early part of June as a Fly. Should the season be wet and cold they increase very fast, and become a general blight: they have made their appearance during the

last few days (letter dated June 13th, Ed.), but, the weather being very warm and the bine full of sap, I think they will be quite overcome this season.”—B. BISHOP, Mill Farm, Pencombe, Bromyard.

“My own impression (at present) is that the Aphis first presents itself as the Green Fly, which speedily deposits an enormous crop of Lice.”—E. MONCKTON, Hale Place, East Peckham, Tonbridge.

“May 26th.—Fine showers from the north, with brilliant day following. Hops perfectly clear of Aphis.

“May 28th.—Long-winged Fly made its appearance in considerable quantity. Careful examination of the hills discloses none other than on the first upper pair of leaves: no ‘Louse’ to be seen or egg at present. Only one garden yet attacked, and no Plum, Sloe, or Blackthorn tree round any of its hedges.

“I have searched several hills with Fly on the top to see if I could discover any working up the bine, as if from the ground, but without success.

“May 30th.—I find less Fly this morning than on the 28th, but I found on what would *then* have been the first upper pair of fully-expanded leaves (now doubled in size), a few straggling ‘Lice,’ and all search on leaves below these (which, I submit, the ‘Fly’ settled on) prove them as free as possible.

“I have been examining Sloe and Blackthorn bushes in the immediate neighbourhood of the Hops, but they appeared remarkably free from blight of any sort.” — GEORGE TURVILL, East Worldham, Alton, Hants.

“I have not a shadow of doubt but that the generation in the spring commences with the Long-winged Fly. They appeared this year (very sparsely, it is true) about the usual time, and quickly laid a thin sprinkling of young nits.”—D. TURVILL, West Worldham, Alton, Hants.

“Here and there a straggling Louse has been seen. The first Fly I saw was on Sunday (June 3rd), and now there are not many.

“June 8th.—I enclose you herewith insects from Hop leaves. (These were Hop-lice, that is, Aphis, in first stage or stages, one having just shed its skin, and winged Fly).

“June 14th.—The day before yesterday I had a hunt for nearly two hours to see if I could find an Aphis on the branches near the ground, but without success.”—W. GARDNER, Bekesbourne, near Canterbury.

“June 15th.—Respecting the Hops that we have in the garden for experimenting on, I have closely watched them from the time the young shoots first peeped above ground, and up to June 2nd they were as clean as could be, not the slightest trace of Aphis to be found. On the afternoon of June 2nd, on examining the bines, I found a few Fly,—very few,—perhaps one or two on a shoot, but I particularly

noticed that none of the Fly were low down on the vines, and they also appeared to be very weak."—ARTHUR WARD, Stoke Edith Gardens.

"May 28th, 1883.—I beg to hand you herewith a winged Aphis from Hop. I have two more I can send you, if you desire them. These were got yesterday looking over (under rather) some hundreds of leaves in a hop-yard; only these were then met with. Each was ovipositing,* and on the leaf with each was (at some small distance) one small, newly-hatched, Aphis; on no other leaf was a wingless Aphis seen, except on one leaf (of the same plant with one of these Aphides) four very small Aphides were found.

"Last year (1882), somewhat later than this, I saw no winged Aphis, yet *every leaf* had small Aphides (perhaps fifty to a leaf) tolerably uniformly distributed over it. These could not all have been the progeny of winged Aphides, and there were larger ones amongst them.

"May 31st.—I yesterday visited another hop-yard, and found the Aphis more abundant, but hardly any young ones. Each Aphis had deposited not more than one or two, judging both from the size of the young Aphides and their numbers.

"June 2nd.—The winged Aphis is more abundant, but only at the margins; the centre of the Hop-yard is still quite clean. The young Aphis only occurs with the winged Aphis, and is on the under side of the full-grown leaves, where an occasional Aphis ovipositing (see note) may be found. The mass of the winged Aphides are in a sleepy state on the leaves of one or two inches long.

"July 2nd.—In the Hop-yards the plants are not only outgrowing attack, but some circumstances must be terribly against it. Most Hops have Aphides, but these are nearly all the newly-hatched ones, and they are not abundant."—DR. T. A. CHAPMAN, Hereford.

I have communications from various observers of Lice being seen later in the year, that is about August, on branches and leaves near the ground, which is important practically because in these cases, where attack is confined to the lowest parts of the plant, the spread may be checked by the treatment advocated by Mr. C. Whitehead, of removing these infested leaves and branches, and destroying them before the Lice on them can come to the winged state; and also feeding them off by sheep. But, with regard to its bearing on first appearances, I would submit this fact of the Lice *being seen* on the lower leaves at a later date strengthens the probability that they were not there to begin with, for the simple reason that it shows that they are plainly distinguishable when in any quantity.

* "The ovipositing is doubtfully entitled to the name, the young Aphis being perfectly developed, but I think within a membrane."—T. A. C.

OBSERVATIONS AS TO THE HOP APHIS MIGRATING FROM PLUM AND SLOE.

In the following observations the Hop Aphis is noted as *migrating from Sloe, Plum, and other trees*. With regard to the Sloe and other kinds of wild or cultivated Plum there appears no reason why this should not be the case.

Our own observations this year have shown that Hop Aphis is to be found infesting the Plum, and previously to this notes have been published by three well-known German entomologists, stating respectively that the Hop Aphis is found on Sloe, and therefore Sloe bushes ought not to be left near Hop-grounds* ; that this Aphis is to be found in May in great numbers beneath the leaves of the Plum and Sloe, and that in the month of May they (the *Aphis Humuli*) leave the Plum leaves and betake themselves to the Hop† ; and the third states that the Hop Aphis is to be found from July to September in large numbers on the Hop, and that he has seen this on Sloe bushes in May.‡

Our own countryman, Francis Walker, states that the Hop Aphis, the *Aphis (Phorodon) Humuli*, “migrates in early spring from the Sloe to the Hop plant, and again leaves the Hop in autumn to go back to the Sloe.” § The first note is as follows :—

“I have been a Hop grower forty years, and have ever paid great attention to the Hop blight, carrying a magnifying-glass, and many times a day examining the earth round the hills and the plants from top to bottom ; also the hedges, bushes, &c., the grass along the hedges, and wherever I could get a clue towards destroying the Aphis before it attacked the Hops.

“I do not think the eggs are deposited in the earth round the hills, as there are never Lice on the plants first, but Fly ; the Lice come from the deposit of the Fly.

“The Fly comes from other sources. I have always found them on the Maple, Damson, Sloe, &c., as Lice first, and when they come into Fly they take wing to the Hops, and settle on the tips of the plants, on three or four of the upper joints where the young leaves are tender. They do not get on the bottom of the plants, except the wind blows them off on the ground. The blight attacks the Hops near the above-named trees first, and more severely.” — HORACE COLEMAN, Brede, Sussex.

“My experience is, an egg in the first place is deposited on plants such as Plums, Blackthorn, and Willows. Later in the season that

* ‘Praktische Insecten Kunde,’ Dr. E. L. Taschenberg, part v., p. 50.

† ‘Die Pflanzenlaus Aphiden,’ C. L. Koch, pp. 115, 116.

‡ ‘Die Pflanzenfeinde,’ J. H. Kaltenbach, p. 534.

§ ‘Annals of Nat. Hist.,’ xx., p. 209.

deposit brings forth Lice, which after a time turn to Fly, and thus visit the Hop plants. You can generally tell in the spring, several days before an attack on the Hops, whether you are likely to have it.” —T. HAMMOND, Fordcombe, Tunbridge Wells.

“The severe attacks are generally foretold by the time of picking in September. When at that time the Lice abound to an enormous extent, the pokes are covered—the pickers’ hands are moist with Lice—then the attack is certain in May or June following. Previous to the attack Lice are found on Blackthorn; these Lice turn to Fly (I have seen them). As soon as the Blackthorns are clean Fly cease.” —F. ARNOLD, Saint’s Hill House, Penshurst.

“It appears that the blight first shows itself on the Blackthorn, then on the Sloes, so by degrees on all forest trees more or less, especially in the Willows, &c., and in such numbers that it is impossible to deal with the insect as a whole.”—F. L. HAUSBURG, Edenthal, Penshurst, Kent.

The foregoing observations appear to me to point very strongly to the probability of attack coming on the wing, and from Plum and Sloe; and most careful search made in earth taken from the roots of infested Hop plants has not shown that either in winter or spring eggs or Aphides are lying there.

Eggs or Aphides have not yet been found, either in late autumn or winter, on dead bines, leaves, earth, or root-stocks, or on growing shoots in early spring.

Mr. G. B. Buckton mentions in March, 1883, he received a block of earth containing the root-stock of a Hop plant which had been infested with Fly during the previous year. This he examined carefully, “taking a spoonful at a time, and viewing it under lenses of different magnifying powers,” and, he says, “I could not find a trace of either Aphis or eggs.”*

EARTH.

My own observations began by careful examination of earth received on November 29th, 1882, sent me from Hop hills known to have been infested by Aphides in the previous season. I kept this (carefully secured) out of doors during the winter, and, on the 19th of March, examined some of the earth: as nothing appeared in the shape of Aphides either then or afterwards, on the 8th of May I turned the contents of the box out and examined the earth with great care, but I did not find either eggs, or Lice, or Fly. My observations were taken both by examining the earth under a lens, and also by putting portions in water so as to detach any light bodies and examine them on the surface. In the course of all this I detected a very few—perhaps four

* ‘Brit. Aphides,’ by G. B. Buckton, F.R.S., vol. iv., p. 187.

altogether—of what might be eggs, or broken pellicle of eggs, of some insect, but that was all.

In the course of the present autumn I have carefully examined earth from the roots of the Hop mentioned, which had been isolated and severely attacked, but have been unable to find any Aphides or eggs.—ED.

DEAD BINES, LEAVES, &c.

With regard to winter harbour of Aphis on the cut bines, dead leaves, or in bark or Hop hills, I can state that I received a bundle of Hop bines from Kingsnorth, Kent, some time previous to November 29th, 1882, and examined pieces of these minutely, but could not detect either eggs or Aphis presence of any kind in any nooks or crannies, nor did any develop in spring.

I also examined the bark of some sets sent me from Detling without finding Aphides or eggs. Some of these leaves I forwarded to Mr. Buckton, who examined them, but similarly did not find Aphis presence.*

The following notes show similar results from observations on the growing plant early in the year (March 21st or 29th) and the earth in August :—

“ I have been looking at my Hop hills, but can see nothing ; the shoots are about two inches long, and when cut through longways the young leaves can be seen quite plainly about the size of peas, but I can see nothing at the present like egg or Fly or Aphis.” †—RICHARD COOKE, The Croft, Detling, Maidstone.

With regard to the other trees mentioned, as Willow, &c., there is this much to be learnt from it, that the state of the weather which is favourable to Aphis increase on one kind of tree or bush will probably be to another ; therefore, if great increase is observed to be going forward, Hops should be looked to. But with regard to the *special* Aphides of another tree infesting Hop, I believe there is no trustworthy entomological record at present of that being the case.

* Perhaps to those who are not acquainted with the great value of the opinion of Mr. Buckton as to species or method of life of Aphides, I should mention that he has devoted many years to the study of their methods of life, and is the greatest English—possibly world-wide—authority on their life-histories, and the author of a long and elaborate work giving figures of all the English species in their different stages.

† In two or three cases of detailed and very good observation of some small insects (supposed to be Hop Aphis in its early stage) being observed going up the stems from the ground, I think that the attack was not Aphis, but of the Hop Frog Fly. The specimens in one case were noted as so small as to be “ almost imperceptible ” ; in another, when forwarded, they proved to be of Frog Fly, “ Jumper ” (*Euacanthus*, scientifically) ; and to a non-entomologist these insects, when in their first stage, would look very much alike. I have therefore not given the notes here.

Aphides from Elm, or Lime, or Willow, or Sycamore, may sometimes be *found* on Hop; they may even be seen for two or three days, and may produce young, but, as far as I can learn or have observed myself, these points are merely accidental, and no permanent lodgment is effected. In the course of the present season my own Hop plants were sprinkled with Aphides from neighbouring Elms, but these females produced young equally on the spiders' webs as on the Hops, and all soon passed away. If the Hop Aphis is examined under a pretty strong magnifier it may be known by having tubercles on the forehead, with a tooth on their inner side; *and* also by the first (that is, the lowest) joints of each of the horns being bluntly toothed or gibbous. From this characteristic it takes its present generic name of *Phorodon*, signifying to bear a tooth; and if we could find this Aphis on other trees (as we do on Plum), and as we apparently very likely might on the Nettle, this would be very important.

In the course of June in the past season I received the following note regarding

HOP FLY ON NETTLE.

“June 15th.—I may add that I found some of the same kind of Fly on Nettles close by our Hops.

“June 18th.—I send you some Aphides I have gathered from Nettles. I have examined the large green one, and it appears to me to be the same as the one figured in your Report (see p. 1, fig.). During the day it has given birth to two young ones. There is another with wings, but I think the others are not the Hop Louse.”—ARTHUR WARD, The Gardens, Stoke Edith Park, Hereford.

I examined the females and young Aphides forwarded with great care, and could not find that they differed from the Hop Aphis and its young. They are certainly not the Nettle Aphis (*Siphonophora Urticæ*, Kalt.); and it will be observed that Mr. Ward notices seeing two kinds on the Nettle.

It may have been an exceptional case, but still this matter well deserves searching into. The Nettle is so nearly allied to the Hop that it is likely enough on the face of the thing that the Hop Aphis should frequent it; and a remark is also given on this subject at page 3. If the Nettle is a *host*, as well as the Hop, of the Hop Aphis, it would account for borders of gardens being often first attacked, and in any case some experiment as to destroying Nettle beds, which may very likely be winter shelters, would do good.

We do not yet know whether the female Hop Aphis lives through the winter, or whether, as may very likely be the case, she produces eggs in the autumn and dies,—this may vary according to the winter being mild or severe; but just as in the case of the Bean Aphis (which is one of this tribe), we know that, though there may have been no

Bean crop for a long time in a field, yet that from some neighbouring shelter or other there come the females which produce the Colliers ; and so it appears with Hops. In the case of the Bean Aphis (for one place) they shelter in Gorse ; and if either with Bean or Hop we could find where the shelter *commonly* is, then we could go forward.

The preceding observations give (as far as I can give it at present) the state of the case as regards first appearance of Aphis. As far as these observations go, it appears that the attack is certainly *first observed on the upper part of the plant, and in the form of Fly* ; and that we have no evidence from the most careful search that the eggs or the Aphides are to be found in autumn, winter, or spring, anywhere about Hop-rubbish or in the earth.

But nevertheless I do not think the point is proved yet, for this reason :—I am aware, though the notes have not been sent in this year, that there have been a *few observations of Lice being first seen*. I noticed that amongst my own Hops, the only plants which escaped attack were a set or two which I had examined so carefully for Louse and egg presence that hardly any earth or shelter remained. Also, though I failed to capture it, I have seen what appeared to me to be the wingless female early in the season on the lowest leaves of a Hop yearly infested in my own garden. Also, though I have not wished to introduce exceptional conditions into this paper, I have a note taken after careful examination by Mr. C. Whitehead, in which he informs me that in a Hop plant which he was growing in a greenhouse the first appearance was certainly of ‘Lice.’

This is an important observation, and so is the following :—

ISOLATION OF HOP.

“ In answer to your letter respecting the experiment on the Hop covered with muslin, I had the plant covered up early in the season (about the end of May), first of all seeing that the plant was thoroughly clean. I used three poles about nine feet high, placing them triangularly round the plant (the three poles meeting in a point above it). I then tacked the muslin securely to the poles from the bottom to the top, allowing six inches of muslin to be buried in the soil at the bottom to make sure that nothing could get in, except they came directly from the soil. It was simply impossible for anything to get in from the outside, the muslin I used being very fine. The plant continued clean, as I informed you in writing to you once or twice afterwards [it was mentioned up to June 15th as being ‘perfectly clean,’ ED.] On examining the plant again I found that there were a good many Fly on the leaves, and also a quantity of wingless Aphides ; and later on (on August 9th) these plants that were covered with muslin were

swarming with Aphis from top to bottom, and there was hardly a green leaf to be found.

“On August 16th it was noted :—The Aphides have gone on increasing to such an extent that they have almost killed the plant. The top and under side are smothered with them, and the stems and all the interior of the muslin are full of the dead bodies of the Aphides. Now these Aphides must have come from the ground, for, as I stated before, it was simply impossible for any insect to get in.”—ARTHUR WARD, The Gardens, Stoke Edith Park, Hereford.

In the above experiment it will be noticed that the plant was very carefully examined and considered clean at the time of enclosure, and for more than a fortnight afterwards, although subsequently the Aphides appeared in such numbers, nearly to smother the plant. This experiment seems therefore to point in this case to the Aphides coming up from the ground or from crevices in the stock or roots, where in some shape, it may be as eggs, or it may be as females hibernating, they had passed the winter.

It would be a most serviceable thing if this experiment was tried in different localities. It would be no great trouble to put three poles over a Hop-hill, and fix stout muslin so as to stop ingress or egress, and, by setting up the poles early in the year before Hop Aphis was about, or indeed, to make quite sure, before the plants began to grow, there would be no need to watch to be sure of not enclosing Aphis on the plant. If we then found, on the authority of many observers, that the enclosed Hops were attacked, we should have positive proof that a part at least of the attack comes up out of the ground, and the necessary treatment of the soil or Hop-stocks to get rid of the harbouring pest during its quiet state, would very shortly be made out by those most concerned and experienced in Hop growing.

I may add the experiment was undertaken at my request by a thoroughly competent observer, in imitation of the method by which Prof. Riley, State Entomologist, U.S.A., discovered the missing links in the life of the Grape *Phylloxera*.

EFFECTS OF HEALTHY GROWTH.

The following notes refer to the effect of a healthy state of the plant on the non-increase of Aphides :—

“It will be noticed that it is not the point of the healthy Hop growing past attack, which attention is specially drawn to here, but that in *certain states of sap the Aphides do not increase*. This exemption from attack has often been noticed, sometimes in one special locality (as I believe is often the case in the Isle of Thanet), sometimes in the case of what is known as a “lucky” ground or part of a ground, or in the lesser instances of a few hills or a single one.

It would be exceedingly useful if any information could be given as to the cause or causes (as they may be many) of this exemption, such as exposure, temperature, manure, &c.; also whether there was any special presence or absence of woods or hedges, or waste weedy land near. The first note is as follows:—

“I have observed many times a pole or hill keep quite clean when the surrounding hills were infested with blight, and if these vines run on to infested poles there is something about them too healthy to allow the Fly and Lice to get on them.

“I always fancy, when we get these severe attacks of blight, that, although the plant may look rank and strong, there must be something wrong about it, perhaps a lot of unhealthy sap, through excessive wet seasons, so that the plants, ^{earth} and atmosphere may be in a fit state, if not to cause ‘blight,’ certainly to encourage it. My plan has always been, by extra cultivation and attention, to endeavour to get the plant *healthy*, and I have succeeded so far that I have never been so blighted in any year but that I have got many of my Hop-gardens through. Some of them last year (that is, 1882) looked very beautiful.”—HORACE COLEMAN, Brede, Sussex.

“There is a Hop-garden on the Kentish rag near Maidstone: in the early part of this year (1883) the vine was slack, and it was forced on by the application of rape dust, one ton to the acre,—this is a heavy dose. This has produced a young succulent growth, which has been badly attacked by vermin. Grounds near it are practically clean, so that too great forcing is nearly as bad as too severely checking the plant by unfavourable weather,” &c.—RICHARD COOKE, Detling, near Maidstone.

“Hop Aphis usually appears after an ungenial season, when the Hop plant for some reason has become unhealthy, and hence the attack, just as animals which are diseased will be covered and their coats filled with vermin. If the Hop plant can by genial weather resume its healthy state before the Aphis has overpowered it, then the Aphis will leave, and a moderate crop will be grown.”—EDWARD MONCKTON, Hale Place, East Peckham, Tonbridge.

WASHES.

The following notes refer mainly to the benefit and method of application of washes:—

“Last season the only good Hops that could be seen for miles round were in the immediate vicinity of Penshurst, the fact being that the Hop-gardens here are of a limited extent; they are kept clear of weeds, well manured, and when the Aphis appears the plants are washed again and again,—in fact, so long as the insects appear; the farmers are able to find sufficient labour here to do it.

“Where the cultivation is not so careful, or where Hop-gardens are too extensive, and the local labour not sufficient to battle with the evil, then the Hop is destroyed by the Aphis.”—F. L. HAUSBURG, Edenthal, Penshurst.

“The washing of Hops is an expensive process, as it comes at a time when the summer work requires to be done, and some must be delayed. I commenced washing this year (1882) about the 2nd of June, and continued for about seven weeks, washing them all every week or eight days.

“I used engines with one hose, one lad to pump, one to direct the hose, and one to carry water, if near at hand ; if from a distance this would require a little extra.

“I used 14 gallons of water to 1 lb. of soap, with a little addition of soda, but I am not certain whether the soda was really useful. Some of my neighbours used 10 gallons, some 12, to 1 lb. of soap. I used the best soap, and preferred to use a greater quantity than to be more careful, and not use so much of the wash when made stronger.

“I have gone through all my expenses, and I find the cost, reckoning everything, to be about £8 per acre.

“I put on about 500 gallons of mixture to every acre at each dressing. I consider the soap to be worth something as manure.

“I begin to pick on Monday (Sept. 11th, 1882, Ed.). Crop, as I set my average, about 8 cwt. all through. The Colgates are not growing out through the wet and cold, or I should put them a little higher. It is sad to see the great bulk of the plantations: very many grounds will not have a bin put to them.”—T. HAMMOND, Fordcombe, Tunbridge Wells.

“June 15th.—I find that but very little Fly has appeared round here. Lady Emily Foley’s Hop-yard was attacked about a fortnight ago, only slightly. The Hops were washed at once with soft-soap and water, and I believe the Fly has disappeared.

“I have found the following mixture to answer admirably for syringing or washing the Hops, the effect being to kill the Aphides almost instantaneously, and it does not injure the burr:—For large quantities, 12 lbs. of soft-soap and half a gallon of paraffin to 100 gallons of hot water; to be stirred well together and used when cool. I find paraffin mixes well by using hot water, the nearer boiling the better.”—ARTHUR WARD, The Gardens, Stoke Edith Park, Hereford.

“I take but little heed of the winged Aphis, but when followed by Lice and Nits the blight becomes dangerous, and the plant should be washed with soft-soap and water,—9 lbs. of soap to 100 gallons of water I have found most efficacious,—at the same time freely using stimulating manures, ammonia, nitrates, soot, &c.

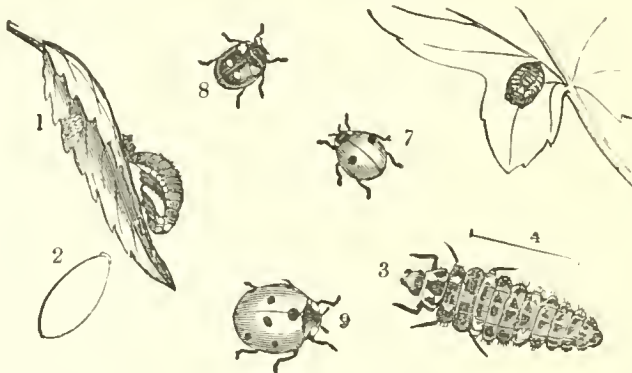
“The only entire failure of Hop-crop I have had was in 1879, and

this, I believe, was to a certain extent my own fault: I did not persevere with washing and stimulants. Last year I grew 20 tons on 70 acres. I attribute my success not only to washing and the free use of stimulating manures, but to early cutting.

"I commence this work directly the sap is down, and finish in January. . . . I find my method ensures an early and strong bine, much more capable of withstanding attack of blight than a late and weak plant. My bine is now (May 25th) three-quarters up the poles, and, with a continuation of favourable weather, will top them in fourteen days.

"If frost will injure the shoots of the plant that is cut early, we should have found it this season, when we had such a continuation of frost all through March."—J. HOPKINS, Lower Wick, Worcester.

LADYBIRDS.



Ladybirds. 2, egg, mag.; 3, 4, grub, mag., with nat. size; 7, *Coccinella bipunctata*; 8, *C. dispar*; 9, *C. septempunctata*.

The following notes bear witness to the good done by the Ladybird Beetles and their grubs in destroying Aphides, and also the vast numbers in which these variously-named Beetles and grubs appeared early in the past season.

Care should be taken that these helpers are not destroyed when they appear, as is not unfrequently the case, in such numbers that they lie open to being swept up; and further, as we all know these Ladybirds winter in warm dry shelter, that it would be quite worth while to examine in Hop districts whether any noteworthy quantity of them were to be found in sheds, or amongst heaps of poles or rough wood, or any other shelter near the gardens.

Many insect attacks may be kept down by clearing away such shelters; in the case of the Ladybird it is very possible that the Beetles might be much more preserved than at present by leaving their resorts. Anyway, it would be worth inquiring into.

"June 2nd.—*Coccinella* is now plentiful near Hereford.

"July 2nd.—The 'Collier' is abundant; nearly every Hop plant

has several batches of eggs, as well as larvæ of the *Coccinellæ*. I should not like to say positively that the Aphis is entirely held in check by the Ladybird, but I think the evidence to that effect is strong.”—Dr. T. A. CHAPMAN, Hereford.

“The ‘Crocodile,’ or larva of the Ladybird, is a great enemy to the Hop Aphis; two or three will clear a Hop-stock in a very short time. The Ladybird lays her eggs in beautiful order under the Hop leaves, and, as soon as hatched, the larvæ begin to feed, and shortly clear the Hops of their blight; but unfortunately they do not come soon enough to stop the Fly from breeding and spreading their numerous progeny.”—RICHARD HEMING, Cheltenham.

“The ‘Fly Goldens’ are our best friends; they feast greedily on the Hop Fly. They lie dormant during the winter in our houses, buildings, &c., and are now (May 12th) resuming life again. If we were to watch closely where they go they might direct us where the origin of the blight is to be found.”—HORACE COLEMAN, Brede, Sussex.

Ladybirds were very numerous on the inside of the windows of my house near Isleworth for several days previous to April 9th, and a note was likewise sent me from the Kew Observatory, Richmond, of the unusually large number of Ladybirds then to be seen.—ED.

“The Ladybird is well-liked, but disappears (no doubt going into winter quarters) when most wanted towards Hop-picking. The Niggers, that is, the maggot or grub (scientifically, *larva* of the Ladybird Beetle, ED.), appears to be a much greater friend to the farmer; it has a greater appetite.”—F. L. HAUSBURG, Edenthal, Penshurst, Kent.

“Last year it was supposed that the Hops on strings were more suffering from blight than on the poles. I believe it was so, and I attribute it to the circumstance of the stiff hill-pole being preferred by the Ladybird and its larva to the twisting, moving strings.”—W. GARDNER, Bekesbourne, Kent.

“From the immense number of Fly Goldings about this winter (1882–83) the country people predict a good Hop year; whether (if there is any truth in this) it is that a crop-year generally follows a blight when Ladybirds are likely to be numerous, or whether the Ladybirds, when numerous, really do ensure a crop, I suppose remains to be proved.

“To give an idea of their numbers, I moved a Fitzroy barometer, say 30 in. long by 4 in. wide, and the whole of the back was covered with torpid Fly Goldings. Sometimes the sparrow boards of buildings look quite red from the numbers of these insects wintering under their shelter.”—RICHARD COOKE, Detling, near Maidstone.

The preceding few notes cannot be said to give a thorough view of what may be the opinions of many hundred growers. Still, it may be

presumed, as there are communications amongst them from growers in each of the great Hop districts, that if there was any clear belief held of Hop-attack coming in any other way than that mainly reported, it would have been alluded to.

The fact of the first appearance being almost invariably noticed as Fly on the uppermost parts of the plant shows that this is at present the point to which the *remedies* must be applied. With regard to *prevention*, we want more notes. I speak with great submission to the practical knowledge of growers; but, looking at the observations of attack of Fly beginning on the outsides of the grounds, it seems to me that some treatment of the borders of the Hop-gardens might be serviceable, and I beg to suggest whether it is practicable to clear rough ground by hedges, of grass and nettles, and other weeds, amongst which the pest is very likely ^{to be} sheltering. Ploughing, digging, or putting the headland under a ^{very} ~~thick~~ coating of fresh gas-lime, might do much, and any large Hop-grower who would try the experiment and risk the necessary outlay would be doing a very useful thing.

Plums and Sloes appear to foster the evil; but as it comes where there are no Plums and Sloes near, I certainly think that a portion of the attack is from Aphides sheltering about Nettles or other plants, and that a sweeping application (such as caustic gas-lime), which would kill everything living on or under the surface of the waste ground, might be of great service.

The matter of the absence of the Aphides in some places is a very important one, and so also is the preservation of Ladybirds, as far as it can be managed.

In placing these notes, which I have been favoured with by my contributors, before you, I must first beg some of them to excuse me in not having given the whole of their communications, as the points required here were the mere dry observations; and next to note this *is only a beginning*.

It is only those who understand the matter practically that can work the points forward, and I earnestly trust that observation may be continued and kindly placed for publication again in my hands; and on my part I shall be most happy to give every information that lies in my power to any enquirer.

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